Chem

ARMED FORCES CHEMICAL JOURNAL

—U. S. Army Photo

JANUARY-FEBRUARY, 1955

FAMOUS LIGHTHOUSES OF AMERICA

Mile Rock Light guards the south side of the channel leading through the Golden Gate into San Francisco Bay, one of the world's finest land-locked harbors. The lighthouse, built on top of Mile Rock, is constructed of steel and concrete upon a massive monolithic concrete base 34 feet high. The top of the beacon is 90 feet above mean low water. On the opposite side of the Golden Gate is Point Bonita Light.

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COVER PHOTO

White phosphorus, champion among chemical agents for the production of screening smoke, battle-tested in World Wars I and II and Korea, continues to hold its place as an important filling for various types of projectiles. The picture shows the spectacular burst of a WP grenade in a Chemical Corps demonstration for trainees at Camp Gordon, Ga.

The Armed Forces Chemical Journal is the official publication of the Armed Forces Chemical Association. The fact that an article appears in its columns does not indicate the approval of the views expressed in it by any group or any individual other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors.

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Editor
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A. F. C. A. ACTIVITIES

VIEWS ON CHAPTER MEETINGS SOUGHT

A Message to Members from the Secretary-Treasurer

Since the chapter's activity is the basis for most of the Association's activity, its problems become of prime interest to all of our membership.

On the basis of this thought, the letter recently addressed to all chapter presidents inviting a general and open discussion of certain chapter problems is reproduced herewith, and an invitation to discuss the matter is extended to all members interested.

Dear Chapter President:

There are few subjects which can be more profitably discussed by our Association staff than the frequency and character of our chapter meetings.

I am, therefore, writing to initiate an informal round-table type of discussion of some questions which come to mind and which relate to chapter meetings.

Do you think that a minimum of four meetings a year should be held instead of two as now prescribed by our Constitution? Is it too pessimistic to say that a chapter that does not hold two meetings a year can never hold four in that period? What advantage would there be to holding four meetings a year? Is it worth a trial?

We have all known the difficulty in getting top echelon speakers. Of course, where matters of policy are involved, one may find no better authority, but is there not something to be said for a speaker of a lower echelon who may, perhaps, have a possibly better knowledge of the working problems of the subject under consideration? Would not the use of such a speaker as a substitute for one of possibly higher rank prove adequately instructive and entertaining at a chapter meeting?

I believe this is a subject which will stand considerable thought in view of the shortage of top-flight speakers.

Much has been said about which type of meeting is better—a luncheon meeting or a dinner meeting. It is the general thought that because of the lower tariff a luncheon meeting is the more attractive and that the higher charge for a dinner meeting results in decreased attendance.

These are subjects we would like to have discussed. We are anxious to hear your views on this subject and shall welcome any thought you may offer. Other facets of the problem may occur to you. I will welcome your views—we need new ideas. We are guiding a growing organization.

Sincerely yours,

O. E. ROBERTS, JR.

Secretary-Treasurer

Following are excerpts from some of the responses received from chapter presidents:

While I believe that an attempt should be made in each chapter to hold four meetings a year, I do not believe that any such limit should be imposed by our Constitution, for the reason that one would thereby be deprived of flexibility in planning which the chapters now have. As a matter of fact, every since the . . . . . Chapter was founded we have held four meetings a year, with the exception of 1953. . . .

My personal opinion would be that it is not too pessimistic to say that a chapter that can't hold two meetings a year can never hold four per year. If the chapter membership remains the same and no other important conditions change, this would certainly seem to follow.

The advantages of holding four meetings a year are believed rather important. For those relatively few persons who attend all chapter meetings there is, of course, more frequent association with one another with increasing frequency of meetings. On the other hand, the great majority of our membership is not in constant attendance at all of our meetings, but might be able to make two meetings during the year at no particular fixed dates. Thus, it is my belief that, due to the fact that we hold four meetings, we make it possible for our members, on the average, to attend at least two meetings a year, whereas if our total number of meetings were two in number, we might lose their attendance altogether or reduce it to only one meeting per year, which is hardly enough to tie a man into any organization.

Your question on speakers involves some assumptions on the part of the person answering your queries. I assume that by a "lower echelon" speaker you intend someone who is not the director or responsible head of an activity as to which you would like to have a speech given. In my experience here in . . . , which covers all of the years since the incorporation of the . . . Chapter in 1946, we have only had, according to this definition, two "top echelon" speakers. . . .

There is a much more human consideration as regards speakers than is involved in the designation of a man as "top" or "bottom echelon" and that is this: If he is a good and interesting speaker he will be listened to and the meeting will be a success regardless, with obvious limitations of course, of his relative importance in the organization of which he is a part. . . .

We have always held dinner meetings in the . . . Chapter. The reason for this is that all of our eating places are crowded for the luncheon hour and, also, few of us can spare the necessary time at this period in the day.

Another reply:

With regard to the problem of securing top echelon speakers, this, of course is always a problem. An active, well balanced, program committee selected from the various groups of the Chapter, working well in advance of meeting dates can accomplish excellent results. This should be augmented by a list of well qualified speakers drawn up by the National Chapter. It is believed that the local chapter on its own efforts, plus some assistance from the National Chapter can present well balanced and well received programs.

As to a luncheon or a dinner meeting, I believe this is entirely a local problem. It depends on the composition of the local chapters. A combination of both may be the right answer. Luncheon meetings would not be satisfactory at . . . Here at . . . Chapter husbands and wives attend. The wives particularly enjoy coming, a cocktail party precedes the dinner, and couples are deliberately separated at dinner so that they become better acquainted with other members. Following the dinner the business meeting is held. However, one must be mindful that when mixed groups are in attendance highly technical programs must be kept to a minimum in order to have everyone appreciate the speaker. While the expense of a dinner must be borne in mind, I have found both here and at other chapters, if the wives are invited, good attendance results.

Another reply:

With respect to providing lower echelon speakers, it is my opinion that this will be satisfactory, providing that the speaker has a message of interest to our membership.

To the contrary, our experience in . . . indicates that a dinner meeting turns out many more participants than a luncheon meeting. I am of the opinion that one should be a luncheon meeting and the other a dinner meeting.

(As space permits, additional letters from members will be published.).

ANNUAL MEETING PLANS

Mr. Glenn Hutt, one of the vice presidents of AFCA and chairman of the general committee in charge of arrangements for the 10th annual meeting of the Association, to be held at the Hotel Cleveland, Cleveland, Ohio on June 16-17, 1955, recently announced the membership of important subcommittees in connection with these arrangements. These were as follows:

Banquet-Reception

Major L. C. Turnock, Jr., Standard Oil Company, Cleveland, Ohio.
Mr. G. G. Unkefer, Harshaw Chemical Company, Cleveland, Ohio.
Mr. J. S. Wolff, B. F. Goodrich Chemical Co., Cleveland, Ohio.

Hotel Transportation

Mr. Lloyd R. McCoy, Diamond Alkali Company, Cleveland, Ohio.

Ladies Entertainment

Mrs. Robert O. Cutler
Mrs. O. F. Sieder
Mrs. H. P. Connare
Mrs. Russ Lawson
Mrs. Ray Armor
Mrs. G. A. Hutt

Finance

Mr. Ray Armor, Diamond Alkali Co., Cleveland, Ohio.

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Col. Robert T. Norman, Cml. C-Res., Auchincloss, Parker & Redpath, Washington, D. C.

Publicity

Mr. Russel A. Lawson, Monarch Aluminum Co., Cleveland, Ohio.
Mr. F. B. Williams, United Carr Fastener Co., Cleveland, Ohio.

Chapter Liaison

Major H. P. Connare, Cml C-Res., Ferro Corporation, Cleveland, Ohio.
(others to be named)

Programs-Exhibits

Mr. E. D. Hoekstra, H. K. Ferguson Company, Cleveland, Ohio.
Col. O. O. Kenworthy, Cml C.-Res., Ferro Corporation, Cleveland, Ohio.
Major Ralph S. Keller, Cml C.-Res., Cleveland, Ohio.

A meeting of the Cleveland Chapter early in January is contemplated.

CHAPTER NEWS

BALTIMORE: President Prime Addresses Meeting

Photo by Udel Bros.

Mr. W. Russell Greer, recently elected chapter president.

Rear Admiral N. S. Prime, retired, president of AFCA; Major Gen. C. E. Loucks, Deputy Chief Chemical Officer, and Brigadier Gen. Marshall Stubbs of the Chemical Corps were among the guests at the second general meeting of the Baltimore Chapter held on October 27 in the Butler Building, 200 W. Baltimore Street.

Admiral Prime and General Loucks both spoke on the importance of good relationships and cooperation between the Military and Industry and of the role of AFCA in promoting this aspect of National Defense. General Stubbs, who heads the Chemical Corps Materiel Command with offices in Baltimore, also addressed the meeting. An especially interesting feature of the evening was the showing of four films pertaining to military aircraft.

FT. McCLELLAN: WAC Commander Is Guest Speaker

Lt. Colonel Eleanore C. Sullivan, Commanding Officer of the newly established Women's Army Corps Center at Fort McClellan, which is also the location of the Chemical Corps Training Center, was guest speaker at a meeting of the Fort McClellan Chapter of AFCA on November 4.

Colonel Sullivan, who has been a member of the Women's Army Corps since it was organized in 1942, told of the functions of the organization, pointing out that the Women's Army Corps has no specific mission as do other Army organizations, its purpose being to supplement other Corps and where practicable to provide women so as to release men for other duties.

MIDWEST: Dinner Meeting to be held Jan. 21

Midwest Chapter, with headquarters in Chicago, has scheduled a dinner meeting of the chapter on January 21. Major General William M. Creasy, Chief Chemical Officer of the Army, is to be the guest speaker.

CHANGE OF ADDRESS

Members are urged to keep the Secretary advised of address changes.

NEW ENGLAND: Group Meeting Held To Hear Gen. Creasy

Maj. Gen. William M. Creasy, Chief Chemical Officer of the Army, was guest speaker at a meeting in Boston on November 18, 1954, sponsored by the New England Chapter of AFCA.

General Creasy's speech emphasized the importance of good military-industrial relations in furtherance of the National Defense and described briefly the functions of the Chemical Corps.

President Albert A. Brown presided. Others at the speaker's table were: General Creasy; Rear Admiral N. S. Prime (Ret.), president of A.F.C.A.; Major General Raymond C. Maude, Rear Admiral John A. Snackenberg; Rear Admiral Roy L. Raney; Mr. Earl Stevenson; Mr. Chenery Salmon; Mr. Harry Wansker; and Dr. Harold Weber.

The Boston Chapter of the Armed Forces Communications Association participated in the meeting as co-sponsor. Mr. Brown spoke of this, stating it is the intention of the New England Chapter to promote such cooperative action among service organizations with a view to increasing interest in meetings. The coverage of the meeting included television scenes.

NEW YORK: 350 at Dinner Hear Gen. Creasy

More than 350 members and guests of the New York Chapter were present at the annual dinner meeting held at the Savoy Plaza Hotel in New York City on November 17, 1954.

Major Gen. Wm. M. Creasy, Chief Chemical Officer of the Army, the principal speaker, spoke on the subject, "The Importance of the Military-Civilian Team." He referred particularly to the important role of the AFCA in promoting good relationships between industry and the Chemical Corps.

Mr. Simon Askins, president of the chapter, and president of the Heyden Chemical Corporation, was the toastmaster.

The Honorable Jacob Javits, recently elected Attorney General of the State of New York and who served in the Chemical Corps during World War II, also spoke briefly.

Among others present were Dr. Per K. Frolich, recently appointed chief scientist of the Chemical Corps; Lt. General Leon W. Johnson, Commanding General, Continental Air Command, Long Island, New York; Major Gen. William N. Porter, Retired, former Chief of the Chemical Corps; and Rear Admiral N. S. Prime, Retired, president of AFCA. Guests also included many of the Chemical Corps Reserve Officers in the New York area and executives of chemical and other industrial concerns.

SAN FRANCISCO: Gen. Porter The Speaker

Plans of the San Francisco Chapter of AFCA for its winter program provided for a meeting on December 8 at the Officers' Mess, Presidio of San Francisco at which Major Gen. Wm. N. Porter, Retired, World War II Chief of the Chemical Warfare Service, was scheduled as the guest speaker. General Porter, who is now Chairman of the Board of the Chemical Construction Corporation, a subsidiary of the American Cyanamid Company, maintains his offices in New York City. He planned to speak on the subject of Mobilization of the Chemical Industry. In view of the wide interest in this subject and General Porter's extensive experience in that field the chapter invited members of the Western Chemical Market Research Group and the Chemical Industries Section of the San Francisco Chamber of Commerce to attend the meeting.

The chapter calendar also provides for a meeting on February 16, when Major Gen. William M. Creasy, Chief Chemical Officer of the Army, is scheduled to speak.

WASHINGTON: Air Force Research Chief Is Speaker

Major General James McCormack, Jr., Director of Research and Development, U. S. Air Force, addressed a large luncheon gathering of the Washington, D. C. chapter on December 7.

General McCormack pointed to the chemical industry as deeply rooted in vital phases of modern aircraft production and put forward as a suggestion the idea of an AFCA-sponsored chemical research program for new materials of importance to defense. He also suggested that industry apply its scientific brains toward meeting some of the requirements of national defense in the long-range, as well as the immediate, programs of the services. He expressed concern at the inadequacy of the pool of scientific and engineering talent in this country, stating that we should be producing more college graduates in these fields.

The following officers were elected for the forthcoming year: president, Dr. W. T. Read of the Department of Defense; 1st vice president, Mr. L. D. Weiford, Stauffer Chemical Company; 2nd vice president, Mr. Russell Whitesell, Dow Chemical Company; and secretary-treasurer, Mr. John Kley, Office of the Chief Chemical Officer, U. S. Army.

WILMINGTON: Hears Talk on Intelligence

The Wilmington Chapter of AFCA held its fourth meeting of 1954 on November 18 in the Hob Tea Room. Mr. H. J. McCauley, president of the chapter, introduced the speaker, Dr. Shane MacCarthy of the Central Intelligence Agency, Washington, D. C., who spoke on "The Function of Intelligence, Both National and Departmental, In Our Structure of Government."

Other guests of the chapter included Colonel F. H. Barnes, Chief, Delaware Military District; Colonel Roy B. Caviness, Deputy Commander, New Castle Air Base; and Major Mitchell, Universtiy of Delaware.

PROFESSIONAL DIRECTORY

S. N. CUMMINGS
799 Greenwich St. New York, N. Y.
Consultant on Coaltar Colors
Tel. Chelsea 3-1687
Cable Address—Pylamco

HARRY A. KUHN
Consultant
Chemist and Toxicologist
Park Lane Building
2025 I Street N.W.
Washington 6, D.C.
Telephone REpublic 7-1400
STerling 3-6338

GENERAL CREASY ADDRESSES NEW YORK AND BOSTON MEETINGS

(Remarks by the Chief Chemical Officer, Department of the Army, on Chemical Corps organization and operations emphasizing the application of the "civilian-military team" principle, at banquets of the New York and New England chapters of the A.F.C.A., held on November 17 and 18, 1954, respectively.)

At speaker's table, New York meeting at Savoy-Plaza Hotel, left to right: Maj. Gen. William N. Porter, USA (Ret.), past president of chapter; the Hon. Jacob Javits, recently elected Attorney General of New York; Maj. Gen. William M. Creasy, Chief Chemical Officer of the Army; Mr. Simon Askin, president of the chapter, toastmaster; Lieut. Gen. Leon W. Johnson, USAF, commanding general, Continental Air Command; Rear Admiral Nathaniel S. Prime, USN (Ret.), president of AFCA, and Dr. Per. K. Frolich, chief scientist, Chemical Corps.

IT IS A GREAT pleasure to be here this evening, and I deem it an honor to have been asked to be your speaker. This is the first time I have been afforded the privilege of speaking before this chapter of the Armed Forces Chemical Association.

Looking around, I see members of what might be called five distinct groups. There are the reserve officers. There are the former members of the Corps. There are the present civilian and military members of the Corps. There are businessmen who are interested in the Corps in one way or another. And, last but not least, there are the all important wives.

Each of these groups is important in itself in one way or another to the Corps. However, gathered here under the aegis of the AFCA, you represent a collective group – the friends of the Chemical Corps.

As friends, you represent one of the most important public audiences I can appear before. There is no need for me to cite the reasons why this country must maintain a strong stature in the chemical, biological and radiological warfare field. Nor is there any need for me to try to "sell" the Chemical Corps and its program to you. Your very presence here this evening is indicative of your interest in the Corps and what it stands for in our national defense system. As "friends" of the Corps you have made, and undoubtedly will continue to make, efforts to enlighten the public about CBR warfare; to dispel its fears and misconceptions about these so-called "unknown" weapons; and to do what you can to foster a closer understanding between the public and the Corps.

I consider a meeting like this important for it gives me a chance to discuss with you some of the things that affect you and the Corps—because, as friends, it is to you we turn in times of emergency or need. I consider as one of my most important jobs as Chief of the Corps the task of keeping you informed, for our very basic foundation of a successful national defense program must be of an informed public. A group such as this tonight, represents the type of audience I really enjoy speaking before most.

YOU MEMBERS OF reserve detachments and units are of prime importance to the Corps. The many evenings, and the vacations, you give up to maintain your reserve status —these voluntary sacrifices— aid us in maintaining the Corps in a high state of preparedness. Knowing that you are trained and ready to fill mobilization positions gives us a great sense of security. The fact that you, and many others like you throughout the nation, have—as free men —voluntarily given of your time and effort to maintain a strong reserve force for the Armed Forces should also be a warning, small though it may be in itself, to any who may seriously think of attacking our country. The importance of the Reserve Officers can be shown on a proportional basis. In the Department of the Army, the proportion of Regular Army to Reserve Officers is about 24 percent; in the Chemical Corps it is 21 percent. In other words, 79 percent of the Corps' officers are members of the Reserve Corps serving on extended active duty.

I like also to talk to such groups when the wives are present—to assure them that the evenings their husbands spend attending to reserve affairs are not wasted, even if they should never again have to don a uniform and report for active duty. I also want to assure them that in spending those lonely evenings they too, are doing their share in giving our nation a stronger military posture. I also believe that if only 50 percent of all the wives in our nation realized how unrealistic is the public's approach to the CBR weapons, the Corps' stature would be improved 100 percent.

To talk to any group that includes businessmen is a great pleasure, for it is to civilian industry that we turn for a great deal of our needs, whether it be in the research and development field or in the manufacturing field. The businessman is an extremely important and influential figure in today's military-civilian defense team.

Every forward stride we make in strengthening our defense against the encroachments of totalitarianism upon the bulwarks of freedom stems from this team. World conditions are such today that our nation cannot expect to survive without a strong military force. On the

other hand, a strong military force requires the full support of the civilian populace. The days when the military was a "world within itself" are gone. The days when the man at the drawing board is just as important as a general are here. As Chief Chemical Officer I am going to do all within my power to add strength to the military-civilian team which is so vital to us. Meetings such as this will aid in creating that power, for so long as you—the Corps' friends—are informed the stronger will be that team.

PROBABLY ONE OF THE big questions in your minds has been, "What changes are going to be made in the Corps now?"

That's a logical question, and I will give you a partial answer. I say partial because although I have quite a number of ideas for changes in mind, there are only a few that I can feel free to make public at this time. Others have not sufficiently jelled, or need a "green light" from higher authority before we can say much about them.

When I assumed command of the Corps last spring, I had some very definite ideas about the organizational structure that existed within the Corps, and I had plans for embarking upon a reorganization and realignment program. I still have those plans. However, I want them also considered by non-military minds before they are put into effect, for today the military is more and more accepting civilian industry's approach to organizational, research, and production problems. Thus, to the amazement of a lot of people, I have not put the old adage (quote) "A new broom sweeps clean" (unquote) into immediate effect. In fact, I have made only one major change so far.

As some of you may already know, a great deal of the Corps' research and development work has always been carried on by civilians. Up until World War II, most of this work was done by civilian scientists within our own laboratories. In recent years we have stepped up our own laboratory work, and at the same time have been contracting with civilian industry to do a great deal of our research work. A great many benefits have been reaped from this system. However, this program has grown so rapidly and covers such a wide area of fields of endeavor that an overall scientific coordinator has been needed in the Corps for sometime.

We have obtained Dr. Per K. Frolich, as some of you may have read in the October issue of the AFCA JOURNAL, to fill that position. Dr. Frolich was the Vice-President for Scientific Activities of Merck and Company's chemical division. When he joins the Corps on December 1st, he will serve as my Deputy for Scientific Activities and as the Corps' Chief Scientist. Dr. Frolich is highly respected in the industrial and scientific world, and will most assuredly greatly strengthen the leadership in the Corps research and development field. His acquisition is the first step in my reorganizational ideas which are aimed at strengthening the military-civilian team within the Corps itself.

A DETAILED AND COMPREHENSIVE study of the Corps' organizational and operational structure is my second step. During the past few years many changes, both internal and external, have had their influence on our organization. As a result, for instance, new separate activities have been set up; some segments have been made stronger than others; we have lost certain responsibilities while gaining other functions; and the basic ideas behind some agencies have been lost—in sum total, the organizational and operational structure of the Corps is no longer as neat as it should be.

Personally, I have some ideas of how we should tidy up our Corps. So have various members of my staff. In fact, some of you reserve officers probably have some ideas of your own as a result of your active duty tours. However, I feel that we of the military may be too close to the situation to be able to look at it with complete objectivity and come up with the best practicable ideas.

By now you must have gathered that I feel our total mission, and more particularly the concepts underlying it, and the resulting operation must be critically and objectively scrutinized. To obtain this, I am getting together a committee of outstanding industrial leaders who will go over the Corps from top to bottom with a fine tooth comb.

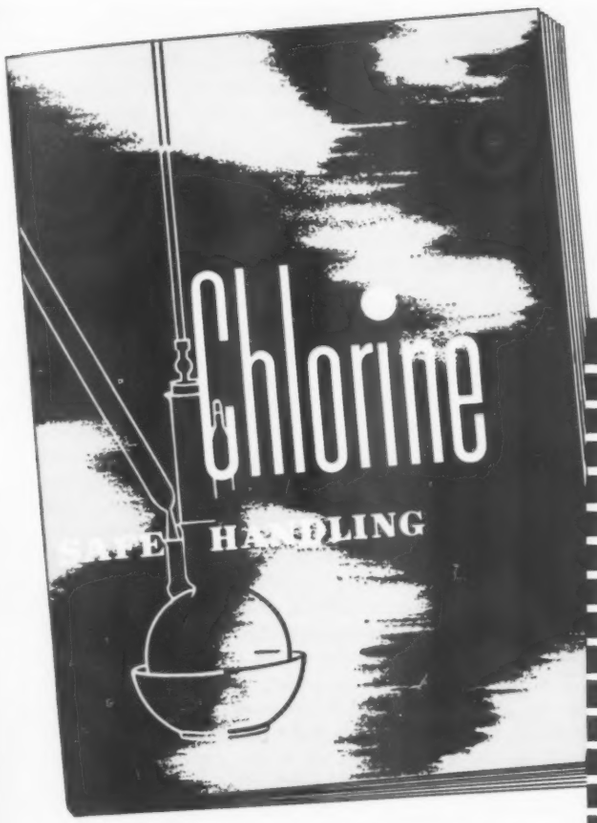
I want this committee to take a good look at the overall

Before the New England chapter dinner at the Hotel Somerset, Boston, left to right: Dr. Harold Weber, head of the Department of Chemical Engineering, Massachusetts Institute of Technology; General Creasy, the guest speaker; Mr. Albert A. Brown, president of the chapter. News coverage of this meeting included television scenes of the banquet.

mission of the Corps and to insure that our organization is responsive to it. This study will not only include our Washington office, but also the various activities and installations in the field. I feel that this committee will explore the following major questions:

1. Is the Corps doing too much, or not enough?
2. Should the Corps have any troops of its own?
3. Should we expand our contractual relationship with industrial, scientific, and educational institutions?
4. Have all appropriate operational functions been delegated to the field commands?
5. Is the best possible use being made of scientists and engineers as well as key military and civilian personnel?
6. Is our organization responsive to requirements of financial management?

Undoubtedly in studying the Corps' situation in regard to these six questions, the committee will come up with some others of their own. As a result, I look for a committee report that will lead to a complete revitalization of the Chemical Corps, for we must keep pace with the advancements being made in the civilian scientific and management field. The field of chemical, biological, and radiological warfare is so unique that we of the Chemical Corps must depend a great deal upon the advice and guidance of civilian industry of all forms. It is still a little too early to announce specific names in connection with the committee, although I can say that oustanding individuals have already indicated their willingness to par-



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ticipate. At this time, really only one other man is needed to complete the committee structure.

THESE ARE TWO ACTIONS designed specifically to strengthen our military-civilian team structure within the Corps, and as it pertains to our dealings with science and industry.

I also have some ideas which are aimed at improving the structure of this team within the national military establishment itself, and at the same time give a basis for more realistic thinking about the CBR field throughout the military organization.

Just as it is with the general public, the Chemical Corps is more or less an unknown quantity among military circles. I think most of the reserve and former officers here this evening will bear me out in this. They too, have had instances where officers from the other arms and services look at the Crossed Retorts and say, "Just what the hell are you guys supposed to do?"

Today, throughout the military, the special weapons and guided missiles programs are held in high esteem. A great deal of this feeling has stemmed from the special one-week orientation courses that have been held at Sandia and Fort Bliss during the past couple of years.

Selected staff officers, and highly-placed civilians within the Defense Department, attend these courses and get first-hand knowledge of the programs. As a result, there is a realistic trend of thought among individuals and planning groups regarding guided missiles and other special weapons.

There may well be a requirement for a similar course to be set up for the CBR weapons at our School at Fort McClellan in Alabama. It is highly important that our top-level commanders and high-level civilian employees in the defense establishment have an up-to-date concept of what CBR is, its capabilities, and its deficiencies. This knowledge must be spread as far as possible throughout the military; for the dangers we face are great and should the chemical, biological or radiological weapons be used, either against us or by us, every arm and service will be involved in one way or another. Such a course is still in the idea stage only, but I feel it might be of great benefit to the Corps and our national defense system.

Along the same line, but from a different approach is an idea that I have already proposed to the higher command.

DURING THE PAST THREE YEARS we have had some 240 Air Force officers assigned to the Corps for on-the-job training. The knowledge those 240 officers gained about the Corps and its work will be of immeasurable benefit to the Air Force in the future. Now, I propose that at least 100 officers from the Army's other arms, technical, and administrative services be detailed to the Corps for one or two years of on-the-job training. The Corps is well suited to provide this type of training since it includes all the type functions of an Army technical service from the initial development of an item through its manufacture or procurement to the eventual incorporation into the weapons systems of the various arms. The tangible benefits to each trainee would accrue in the areas of methods and procedures of management in research, development, manufacture, procurement, handling, storage, and surveillance. The intangible benefits would be a thorough understanding of the mission, capabilities, and limitations of CBR warfare which would be of inestimable benefit to the particular officers' units in the event of toxic warfare.

I might add that a number of the Chemical Corps' Regular Army officers have had two-year tours of duty with the combat arms. They have returned to us with fresh ideas and more realistic approaches to problems involving possible combat use of CBR weapons. We have benefited greatly from the experiences of these officers.

Those are some of my ideas for the strengthening of the military part of our military-civilian team. I realize that they will probably not have a direct effect on you. However, for the reserve officers, it will mean a better service in which to serve should you be called back to extended active duty. For the businessman, scientist, and industrialist the results may make it easier for them to deal with us, and in turn we may get better results from them.

WE DEPEND A GREAT DEAL upon the civilian scientific and industrial field, probably more than is commonly realized.

For instance, recently the National Science Foundation issued a report showing that more than two billion dollars a year is being spent in the United States annually for scientific research—that two billion figure, incidentally, is 20 times the pre-World War II amount. About 85 percent of those dollars are for military research. The Chemical Corps share of this military research money amounted to nearly fifty million dollars during the last fiscal year, and over one-third of this money found its way into private organizations through our contracts for research and development work by civilian agencies.

We have, currently in effect, contracts with approximately 150 commercial firms and 100 colleges and universities for work in the field of research and development alone. The values of these contracts range from $5,000 for utilization of the peculiar abilities of a unique individual on a part-time basis, to multi-million dollar contracts utilizing large industrial organizations.

Besides these contracts for scientific work, we also depend heavily upon industrial science for advice and guidance. The Corps has available on call the consulting or advisory services of about 125 outstanding leaders of science in industry. As a matter of interest, the Chemical Corps, because of its variety of technical activities, has about one-third of the civilian consultants in research and development available to the entire Army. Thus it should be readily apparent that we of the Chemical Corps rely heavily upon the civilian mind for aid and consultation. These figures, although pertaining just to our research and development work, are indicative of the importance of the civilian segment in the military-civilian team for national defense.

And may I add here, these are not "token" consultants. They are working consultants—I am happy to report that I see a number of them here tonight.

ANY STRENGTHENING OF THE military-civilian team must also take into account the general public—the "stockholders" in this team. Because of their tax dollars and sons, fathers, and daughters who serve in the armed forces, the public has a vested interest in the national defense program. Naturally, as stockholders, they want to know what is going on, how their money is being spent, and something about the welfare of their loved ones. They have a right to be informed.

However, to a certain extent the Chemical Corps is "caught in the middle." There are some within the military who feel the Corps already talks too much. On the other hand, there are a great many "stockholders" who say we don't talk enough. It is my firm conviction that there are only two questions which should be applied to any information made public by the Corps. They are: first, does the subject matter fall within the bounds of genuine military security classification; and second, will this information in any way give aid and comfort to the enemy by furnishing him something he doesn't already

know. Should there be a "yes" answer to either question, then of course it cannot be released to the public.

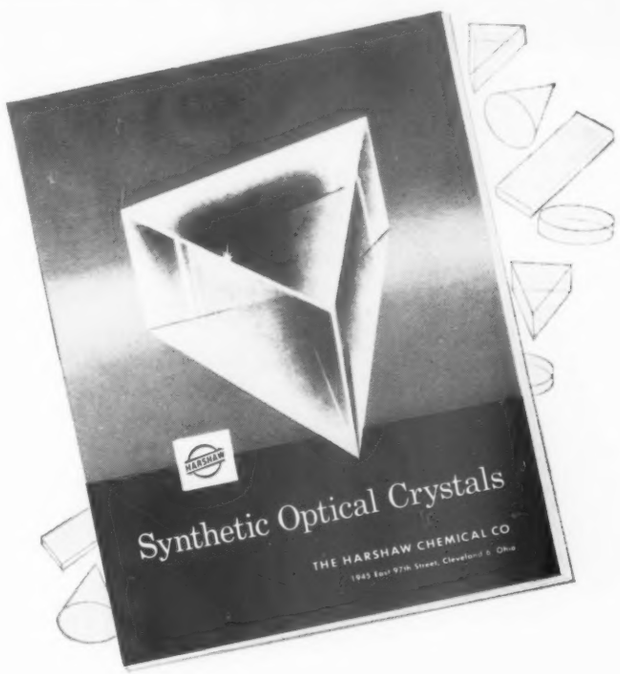
Not only is it my personal wish, but also what I feel is my duty, to do as much as possible to inform the public about the Chemical Corps and CBR warfare. To this end I intend to speak to public gatherings as often as my military duties will allow, and as a means of creating a public understanding about the toxicological weapons. . . .

* * *

The second part of General Creasy's address at these two A.F.C.A. chapter meetings was on the subject of biological warfare and stressed the importance of education of the public and preparedness against such a possibility. The text of that part of his speech followed closely that of a previous speech printed in full in THE JOURNAL (January, 1952). For that reason, and in view of space limitations, that part of his New York and Boston speeches is omitted here.—Ed.

COMPANY REFUNDS TO U. S. $31,000 SAVED UNDER BID

Picture above shows Lt. Col. Frederick J. Hurley, Commanding Officer, New York Chemical Procurement District, receiving for the Government a check in the amount of $31,307.25 from Mr. Harry A. Haus, Vice-President of the George W. Luft Co., of Long Island, N. Y., while 1st Lieut. Frances Berg, Public Information Officer, New York Chemical Procurement, looks on. This check represented a voluntary refund to the government from the George W. Luft Co., as a result of savings under its accepted bid achieved through cooperative efforts of the Chemical Procurement District and the contractor on the production of Chemical Warfare Agent detection devices for the Army Chemical Corps.



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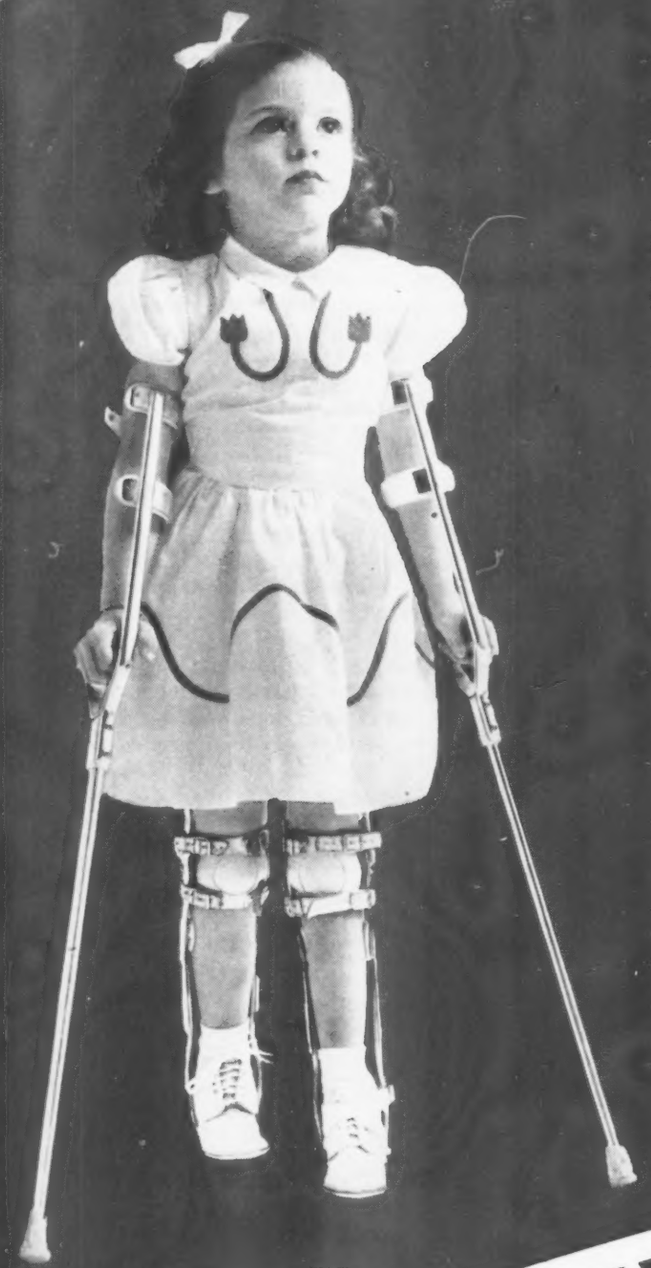

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CIVIL DEFENSE IN NATO

In this article, Governor Peterson presents a broad concept of the radiation hazard from nuclear weapons which he views as a potential danger to rural populations as well as target city dwellers.

Governor Peterson returned to the United States in November from Paris where he attended a meeting of the North Atlantic Treaty Organization.—Ed.

By VAL PETERSON

Federal Civil Defense Administrator

THE NORTH ATLANTIC TREATY ORGANIZATION is more than a military alliance, of course, although that is the first function which comes to mind when NATO is mentioned. The fact remains that this association of 14 free nations also concerns itself with political and economic matters, and the protection of civilian lives and property in the event of war is of the utmost importance in both of these last-named areas.

Under the direction of Sir John Hodsoll, the famed defender of Malta against daily bombings by the Germans in the Mediterranean during World War II, NATO strives for the interchange of Civil Defense information among its member nations with the same zeal that it seeks to bolster the military defenses of the Western World against unprovoked aggression. In this as in other matters of common interest, NATO has proven to be a highly cooperative enterprise. The United States has benefited from the results of these exchanges of information as well as contributing to them.

The Battle of Britain, for example, turned the English into acknowledged experts in the art of rescuing civilians from their bombed-out homes. By contrast, we in this country had had very little experience in civilian rescue work prior to the dawn of the air-atomic age eight years ago. We are learning from the British in this field, and they are learning from us. Today floods and other natural disasters also have become the responsibility of the Federal Civil Defense Administration by Executive Order. While my own State of Nebraska, like other States in the Missouri and Mississippi valleys, is no stranger to the work of fighting floods, we have found that there is much we can learn from the Dutch in combating high water refugee problems. The Dutch, after all, suffered the flooding of almost their entire country in the last war.

Similarly, the Swedes have much to teach us about the construction of deep shelters for vital utilities; the Danes and the Norwegians are experts in enlisting almost every citizen in some form of civil defense service, and other nations have other specialized experiences of great interest.

With the admission of West Germany in the North Atlantic Treaty Organization as a result of the London Conference, another strong resource of experience and skill is added to our common knowledge of life-saving civil defense methods. Like the British, the Germans showed great skill in civil defense during the last war. In Cologne, for example, where 70 per cent of the city was destroyed, only one per cent of the population was lost thanks to well-planned evacuation measures. Cologne was a city of about 600,000 persons before the war; and is now back once more to approximately its pre-war status.

By contrast with the situation in the United States, where we can count on one or two hours of advance warning time, and hope for more, the West Germans can expect only about 20 minutes notice of impending attack —less than that if guided missiles are used. The West German Federal Republic is of course much smaller than before the war, so there is not much room for evacuation measures. Nevertheless its government is planning for strategic evacuation which would affect 50 per cent of the total population and up to 90 per cent of persons living at the hearts of their target areas.

West Germany proposes to use a combination of evacuation and shelter plans, as we do, for protection against subsequent radioactive fall-out as well as initial atomic burn and blast.

Much more to the point in the minds of most Western Europeans is the power of the H-bomb and its possible effects on whole cities and whole nations. I found last spring that reports of U. S. thermonuclear tests in the Pacific had been exaggerated beyond all reason by the world press, with the result that many of our friends and allies were deeply alarmed for their own safety. By seeing to it that our official film of "Operation Ivy"—the first explosion of a thermonuclear device at the AEC's Pacific Proving Grounds—was shown to delegates at the NATO Committee on Civil Defense, we have been able to allay many of those fears.

One foreign official admitted that he had thought a single H-bomb might be capable of wiping out his entire country. He was relieved to learn that a bomb 50 times more powerful than the weapon that leveled Hiroshima would have a radius only three times as great and would destroy an area only nine times as large—not 50 times as large, as he had mistakenly surmised. Thus we see that a reassuring opportunity to talk over such threats among friends is one of the greatest boons that NATO can offer the nations of the Western World.

Needless to say, our own procedures for use in case of atomic attack have come in for a great deal of attention at the NATO Conference on Civil Defense—of which there have been three to date. It is revealing nothing of a classified nature to state that we have arrived at our own civil defense planning stage through tested and tried procedures. Indeed, I have done my utmost as Federal Civil Defense Administrator to include as much of the American public as I have been able to reach in every possible step of our own nation-wide Civil Defense discussions. Unlike most European nations we have been working with known facts about atomic weapons effects from the beginning—and I might add that the essential truths about

the dangers we face have not been kept secret from our people, all rumors to the contrary.

Most Americans know that the dawn of the air-atomic age found us without any assurance that our cities would have more than a few minutes of advance warning in case of attack. Under those circumstances, our original "duck and cover" program was the only possible solution to the problem of saving of civilian lives in an emergency.

As our facilities for advance warning have increased —and there has been a marked improvement in that field in recent months—we have been able to shift our emphasis to evacuation. In order to reduce the risk to our daytime concentrations of people in critical target areas, we now seek to thin out the more crowded areas when the alert warning sounds. Drills and rehearsals in a number of our principal cities have demonstrated that this is practical, and so we are working along that line today.

The "fall-out" of radioactive particles from test atomic clouds has served to highlight a problem which is much greater in the case of the H-bomb than it was in the earlier A-bomb explosions. Such fall-out has been found to descend from cloudless skies in quantities sufficient to sicken or kill persons beyond sight or sound of the blasts which produce this form of radiation threat. This potential danger means that major measures of self protection must be taught not only to the people of our target cities, but our small town and rural populations as well.

It is not without reason that Home Minister Paul Martin of Canada no longer speaks of Civil Defense in terms of target cities or pin-pointed areas of greatest danger. "Canada is the target," he says; and that broad concept is valid today in any nation that faces the threat of atomic warfare.

I can sympathize with the words of a West German woman who conferred with my Special Adviser, Katherine G. Howard, on a recent visit to Bonn. "You don't like to think about Civil Defense in the United States," she told Mrs. Howard, "because you have never had a war over there. We don't like to think about Civil Defense in West Germany, because we *have* had a war over here."

Yet Civil Defense must be thought about, and talked about, and planned for, and acted upon in the U. S. for the same reasons that require us to maintain police and fire and medical and welfare departments here at home—and strong alliances abroad. The ability of good neighbors to work together for the community safety is the secret of Civil Defense in this country as well as overseas. That is what makes NATO an outstanding example of the co-equal partnership between the civilian and the military which today is our sole guarantee of survival in a free world.

CHANGE OF COMMAND OF SCHOOL NAVAL UNIT

Personnel of the Chemical Corps Training Center at Fort McClellan, Alabama recently bid goodby to Commander Claude O. Morrison, Commanding Officer of the Chemical Corps School Naval Unit there since 1951, and welcomed the new incumbent of this position, Lt. Commander Robert O. Boe (at right in picture).

The changeover was marked by a traditional Navy "change of command" ceremony during which each of the two officers concerned read his orders to the assembled personnel of the Naval Unit.

Commander Morrison, and Mrs. Morrison, while stationed at Fort McClellan, devoted much of their spare time to Red Cross work and the aid and comfort of patients at the Fort Hospital. They leave many friends in and about the post and the nearby city of Anniston.

Commander Morrison (at left in picture) will also be remembered there for an information sheet about Anniston and Calhoun County, Alabama which he prepared. Originally intended for the naval personnel at the station, it proved so useful as a guide to places of interest in the locality that it has been in constant demand generally at Ft. McClellan.

COLONEL BOWES HONORED

Colonel Almon N. Bowes of the Chemical Corps Reserve Detachment No. 10, New York Area, on the occasion recently of his retirement from the active Reserve was honored at a farewell dinner held in the 7th Regiment Armory in New York City. In the picture above Colonel Bowes is shown receiving a token of esteem presented by members of the Detachment—left to right: Captain Joseph DeMoia, Lt. Colonel Alfred Wilson, Colonel Bowes, and Lt. Colonel Selig Levitan.

Speakers at the dinner were Brig. General Marshall Stubbs, Chief of Chemical Corp Materiel Command; Colonel Harold Cooney, commanding the New York Military District; and Lt. Colonel Frederick J. Hurley, commanding the New York Chemical Corps Procurement District.

ARMY REORGANIZATION

THE HON. JOHN SLEZAK

Under Secretary of the Army

(Presented here, slightly condensed due to space considerations, is the address by Under Secretary Slezak delivered before a meeting at the Coliseum, Chicago, October 14, 1954, of the Midwest Chapter, A.F.C.A.*)

Through your National Vice President, Mr. Wilkinson, you have expressed your interest in the reorganization plans of the Army. Tonight I shall outline for you some of the reasons why the changes are made, and something of what we hope to accomplish by these improvements in organizational structure and functioning.

The founders of our country came here, partly, to get away from the militarism of their native lands. They viewed with suspicion everything having to do with military forces . . . I think it can be said with accuracy, that it was not until after the Civil War that our Congressional leaders stopped trying to direct wars by Congressional Committee, and became willing to permit the Executive Branch . . . a relatively free hand in the conduct of actual military operations.

To a certain extent, our Army Technical Service organization is reported to have stemmed partly from the desire of the Congress to split up the job of procurement and supply among several agencies within the military. The Congress apparently feared that the concentration of purchasing in a single military agent might lead to an abuse, by the military, of the power which is inherent in this major economic activity.

But, over the period of a century and three-quarters, we have demonstrated that it is possible to have strong military forces in time of need without in any manner becoming a "militaristic" nation . . . . The Army, Navy, Air Force, and Marine Corps serve the nation, and are integrated with our American way of life. They . . . keep their place—completely subordinate to our civilian government . . .

It is our tradtion to have, always, as small a military establishment as possible — sometimes smaller than is prudent . . . .

Until the Industrial Revolution brought with it tremendous strides in the development of weapons, it was sufficient for the Army to give attention primarily to the training of individuals in preparation for war. But beginning with World War I, the mechanization of military forces brought about a fundamental change . . . . Whereas our sources of Army strength until then had been primarily those of manpower, now our industrial potential became one of the important equations in military power.

In World War I, our traditional and historical division of the job of procurement and supply among the various Technical Corps of the Army proved inadequate . . . It was necessary to set up a top control . . . entity headed by the "Director of Purchases, Storage, and Traffic."

Even so, World War I was essentially fought and won with foreign materiel. We were not able, in point of time, to bring our tremendous economic productivity to bear in time to contribute substantially to the logistics of World War I. At the close of the war, and after much argument pro and con, the central logistics director was abolished.

There was a partial recognition of the changing times. After World War I, a law was passed which charged a civilian official of one of the military departments with responsibility for industrial mobilization planning. However, the nature of the future warfare was not sufficiently well recognized to bring about a realignment of the internal Army organizational structure.

Soon after Pearl Harbor, the tremendous problems of war production, and supply, and movement, and management, again compelled us to make a radical reorganization of the departmental structure. Three major commands were created— the Army Air Forces, the Army Ground Forces, and the Army Service Forces.

The Army Service Forces was essentially a logistics command. But it was not confined to materiel and services. It embraced . . . other things which are not directly a part of logistics.

The need to coordinate the activities of the Technical Services—which were furnishing clothing, and ordnance, and chemical materiel, and communications, and construction, and transportation services — was absolutely imperative. So some organization of this nature was inescapable. Yet when a top commander assumed some of the prerogatives which had been the exclusive property of long-established organizations, a certain amount of friction developed. Also, human wisdom is not infallible, and those who absorbed and exercised the powers assumed naturally made some mistakes.

So although the need for central coordination of logistics is undeniable, human nature and conflicting pressures may be credited with the complete abandonment of the logistics command concept and a return to the traditional departmental organization at the end of World War II.

Perhaps we should take a moment to examine the reasons for the need of positive and constant logistics coordination and management at a high level . . . .

In sea warfare, and air warfare, the basic combat

* The Army's new organization plans were presented at the Secretaries Conference with the President at Quantico, Va., on June 18, 1954, and since then have been reviewed in some detail in both the general and military press. In his address in Chicago, however, before an audience of 500 members and guests of the Midwest Chapter, Mr. Slezak dealt particularly with the reasons underlying the changes. It is believed, therefore, that even though many of our members may be familiar with the Army's new top organization, they will find this speech interesting reading—Editor.)

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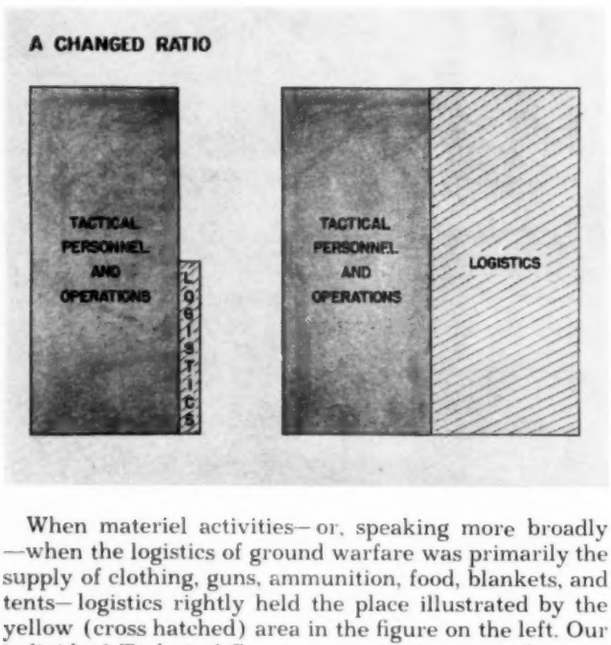
operation depends entirely upon what you might call "mechanization"—using that term in the sense that any kind of ship or plane is an inanimate or mechanical instrument, without which no sea or air warfare would be possible. Therefore the basic unit is the ship or the airplane, and planning starts in terms of numbers and kinds of ships or aircraft. Personnel is not neglected—witness the stirring characterization in the expression: "Iron men in wooden ships!" But the procurement and training of "Iron men" has in no sense minimized the need for the effective development and provision and maintenance of ships and aircraft. In fact, the emphasis in both training and combat is on the successful operation and employment of these instruments of sea power and air power.

In ground warfare, personnel has always been the paramount consideration, and we tend to think of Army management primarily in terms of personnel management. Traditionally and naturally, our combat leaders are preoccupied with the training, and discipline, and employment of tactical personnel. So long as warfare was essentially the physical conflict of one human being with another, this was right and adequate. But with increased mechanization, vehicles and weapons have become something more than merely "logistic support of personnel." Army "materiel" has now become a fundamental instrument of land combat, instead of a mere adjunct.

The change in the relationships between personnel and materiel in ground warfare, has brought with it a change in the relative importance of certain kinds of Department of the Army activity, which might be illustrated by this little sketch.



When materiel activities—or, speaking more broadly—when the logistics of ground warfare was primarily the supply of clothing, guns, ammunition, food, blankets, and tents—logistics rightly held the place illustrated by the yellow (cross hatched) area in the figure on the left. Our individual Technical Service organization was adequate, and no strong over-all logistics management was required. But with the mechanization of ground warfare which is represented by tanks and artillery, and personnel carriers, and DUKWs, and Weasels, and atomic guns, and landing craft, and helicopters, and so on, logistics assumed an importance in relation to tactical troops and operations which might be illustrated by the figure on the right. The importance of Army logistics now makes imperative a quality of top management and coordination which we are not organized to give to it.

The need for reorganization has been recognized for a long time. . . . The Secretary of the Army appointed the Advisory Committee on Army Organization with Paul L. Davies, President of Food Machinery and Chemical Corporation, as Chairman. The other members were C. Jared Ingersoll, Chairman of the Board of the Kansas, Oklahoma and Gulf Railroad; Harold Boeschenstein, President of Owens-Corning Fiberglas Company; Irving A. Duffy, Vice President of Ford Motor Company; and Lieutenant General Lyman L. Lemnitzer of the Army Staff. This Committee made very significant recommendations, and made clear the fact that a different organizational structure alone is not sufficient to enable us to solve our problems. We must also make some changes in the management of the careers of our people.

Most specifically, the logistics portion of military activity has grown to the point where it can and should challenge the best talents of some of our ablest people. And if we are to have the quality of performance in this area which will give us good support without excessive cost, we must find some means of attracting top caliber personnel into this activity. The logistics management job cannot be done, part-time, by military officers whose primary interest is in troops and tactics, and who are available for logistics duty only in between the tactical assignments which are their major interest. Nor can we achieve our objective by splitting up our logistics operations into Technical Service "compartments," and substantially limiting Technical Service officers to these individual segments of the logistics fields.

If we are to attract into logistics those best qualified to perform the exacting duties laid upon them, those officers who choose logistics as a career must have full opportunity to advance into top logistics positions. They must be enabled to win the recognition and advancement in rank which goes hand-in-hand with their broader usefulness. The most natural field from which to draw logistics managers—or logisticians, is from among those who have already chosen one segment of the logistics field as their career. In other words, from among officers of the Technical Services.

Perhaps it will be easier to show quickly what we have done in realigning the organization structure by looking at the new chart . . .

Although the major change is in the logistics field, other improvements have been made. So let's start at the top. . . . In recognition of the responsibility which rests on the Secretary personally for interpreting the Army's needs and the Army's operations to the public and to the Congress, we have transferred Legislative Liaison and Public Information (from the Chief of Staff) to the immediate control of the Secretary.

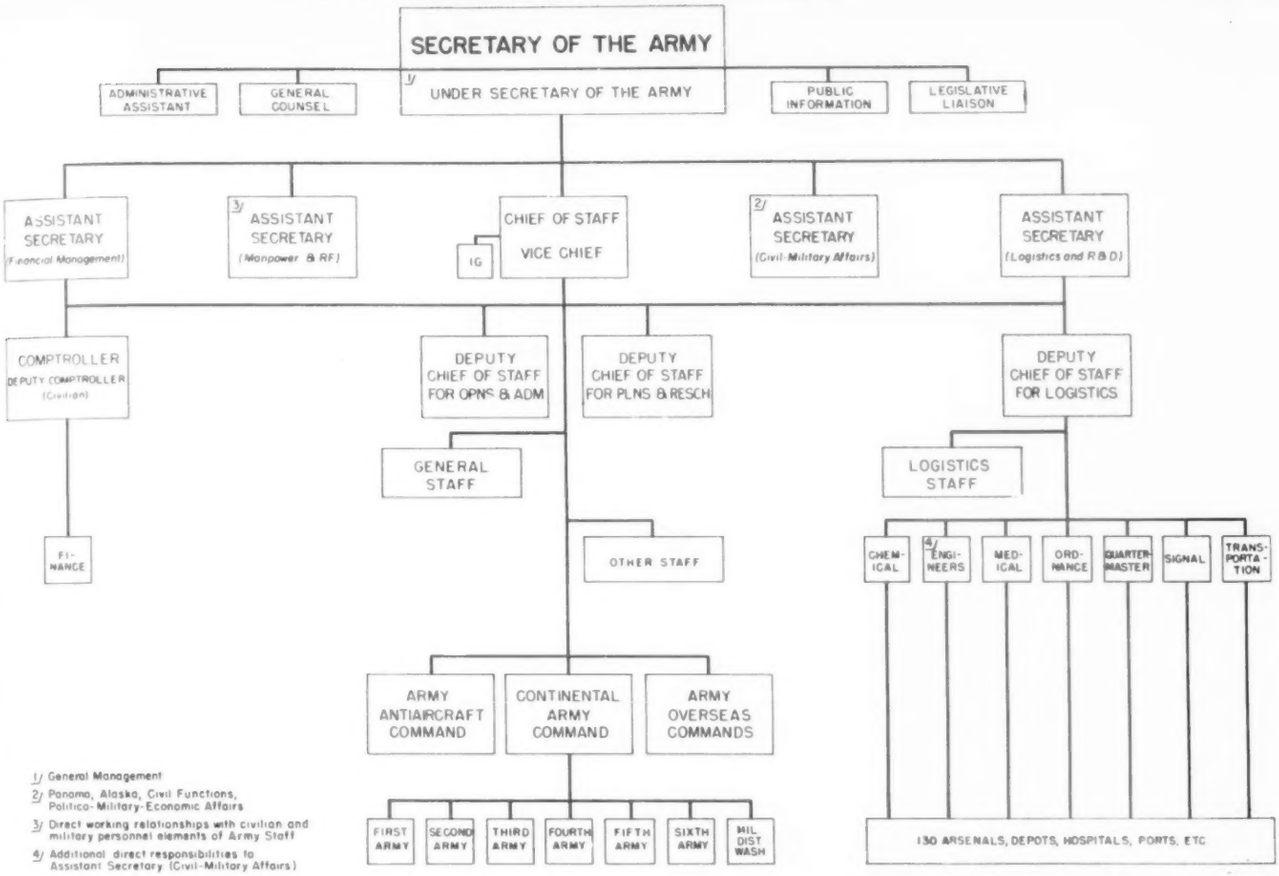
The workload placed upon the civilian Secretariat of the Department of the Army has increased tremendously over the past several years. . . . Now, as you can see, with the addition of two Assistant Secretaries, the assignments can be much clearer, and of more reasonable proportions.

We have retained the Assistant Secretary for Manpower and Reserve Forces, and the Assistant Secretary for Financial Management. One new Assistant Secretary devotes his full time to the Civil-Military functions— . . . The fourth Assistant Secretary devotes his time to Logistics and Research and Development. The Under Secretary has thereby been freed to act as a true deputy to the Secretary.

Another interesting change has taken place. . . . Each of the Assistant Secretaries of the Army has functional working relationships with the elements of the military staff most concerned with the responsibilities assigned to the respective Assistant Secretary. And the position of the Chief of Staff has been changed on the organizational chart to indicate that the Army Establishment is headed by a truly professional civilian-military team.

This does not mean that there is a change in the statu-

NEW ORGANIZATION OF THE ARMY



tory position of the Chief of Staff. . . . he is responsible for the control, and coordination, and effectiveness of all Army operations. . . . the Chief of Staff, for the Secretary, has "supervision of all members and organizations of the Army," as established by law.

Now let's take a closer look at the changes made in the Army Staff. . . . (In) the old organization . . . the G-1, G-2, G-3, and G-4, or "General Staff," in effect, predominated. Now, in the G-1 of the General Staff and the Comptroller organization, we have had essentially a "resource control" type of organizational structure. By "resource control" I mean that the G-1, for example, concerned itself with the details of the needs for personnel in substantially every position, in every activity, throughout every organization, throughout the Army. This meant that, for example, although the G-4 was held responsible for the operations of the seven Technical Services, G-4 did not control the allotment of personnel by G-1 to the Technical Services for the performances of their missions.

Furthermore, even the Chiefs of Technical Services, themselves, had control over only part of the personnel needed to perform the missions of the depots, the arsenals, the ports, the hospitals, and so on. . . . This came about by a rather unique arrangement. G-1 would make an allotment of personnel to the Chief of the Technical Service, based upon minute and detailed justification, for what was called "the performance of the mission." But this allotment of personnel would not include all the people used by—say a depot. Personnel for many of the housekeeping functions were provided by G-1 to the Army Commander of the geographic area in which the depot happened to be. . . . The Army Commander, in turn, furnished . . . people for these housekeeping services—sometimes as much as forty per cent of the total needed. . . . Naturally the Army Commander could have no real responsibility for the over-all performances of the mission of the depot. Nevertheless he had this control of resources. . .

The same thing was true when it came to money. Here again the Comptroller, rather than G-4, controlled, in detail, the funds given to the Chiefs of Ordnance, the Chemical Corps, and Signal Corps, and so on. . . . And here again only part of the funds went to the Chiefs of Technical Services who were responsible for the mission, and the balance came through the Army Commander. . . .

In the new organization we are beginning to depart from a predominantly "resource control" pattern of organization, wherein authority over and control of a resource is exercised without an equal responsibility for the performance of mission.

Naturally there must be a summary and relation of the resources needed for all Army operations at the Departmental level. But this will be summarizing and service type of activity in the future, as opposed to an all-powerful control, such as is in effect now.

From the standpoint of developing military business managers, or logisticians, it is not reasonable to expect that a G-1 staff, composed of predominantly tactical officers, will fully understand the requirements for, and techniques of developing, well-rounded logistics career personnel. This is a field of activity with which they usually have a superficial acquaintance, and which, at best, is of secondary interest to them.

Nor have we developed logisticians by leaving career management to the individual Technical Services. We have developed excellent technicians. But the organizational compartmentation of the Technical Services has

militated against the development of officers well-qualified for top logistics jobs.

We can attract more highly qualified and ambitious officers into the Technical Services, if they know that they are not thereby limiting their chances for advancement and promotion. In the past, a Technical Service officer—at best—could look forward only to two-star rank. We are now making it a policy to assign Technical Service officers to the top jobs in the Logistics Staff of the Department, and to appoint the Deputy Chief of Staff for Logistics from among the officers of the Technical Services, as soon as individuals qualified for such appointment can be developed or discovered. This will open the way to higher recognition and promotion.

These steps are being taken in the conviction that better logisticians can be developed from among those who have already devoted their talents to a portion of the logistics field, than we are likely to develop from among officers whose primary interests and talents lie in the command and tactical skills.

In the new organization, we are realigning the Army Establishment into two major mission areas. This is in recognition of the fact that different techniques of management are needed in producing and managing materiel and logistics services, from those used in training and controlling tactical troops and operations.

Two Deputy Chiefs of Staff will have primary jurisdiction over . . . the "mission area" of tactical troops and operations . . . The Deputy Chief of Staff for Operations and Administration will concern himself with the current aspects of all activities in the organizations shown. The Deputy Chief of Staff for Plans and Research is concerned with the future aspects of these same activities. In addition he has jurisdiction over Research and Development throughout the Army. As you will note, the General Staff is now more nearly a truly "military" general staff, in accordance with its largely tactical orientation.

On the right side . . . is the logistics "mission area." The seven Technical Services are under the direction and control of the new Deputy Chief of Staff for Logistics. The Logistics Staff will do most of the work previously charged to G-4. The control of Technical Service personnel and funds will also be charged to the Logistics Staff.

Control "by mission" will in the future be primary, and control "by resource" will be secondary. It is our hope to extend this concept so that the resources to do every job can be handed to the officer who has that job to do, in a package.

The extension of the "mission control" concept will, we hope, some day operate . . . [so that] . . . at each subdivision of responsibility, the assignment of the resources needed to do the job—personnel, money, materiel—will accompany the assignment of the work, and come from the same source.

One more major change is being made. Each overseas theater has its commander in complete control. In the United States, we are setting up central responsibility for, and control of, the logistics mission. In the tactical troops and operations mission area, recruiting, and training, and General Reserve Troop activities are divided up on a geographical basis—into six Army Areas and the Military District of Washington. The Commanders of these areas now look to the various sections of the Army Staff in Washington for direction. Under the present organization, there is no coordinated direction of their over-all activities—which are substantially similar to each other, although the Army Field Forces does have jurisdiction over doctrine and training.

It has been generally agreed for a long time that a central control of these Army Areas should be established, separate and apart from the Army Staff—which is concerned with worldwide operations.

The Continental Army Command is shown here in its relationship to the six Armies and the Military District of Washington.

To summarize, we are reorganizing the Army so that it will be more responsible to our needs, and so it can function in war as well as in peace, without major reorganization after war starts. . . .

The basic concepts are sound. If they can be applied energetically, and long enough to change the old habits of thought and the ways of doing things, the time should come when the new pattern of "mission control" will seem as natural as the old pattern of essentially "resource control." . . .

What will the new Army organization mean to individual industries?

It should lead to standardization among the Technical Services in those operations which benefit from standardization. And it should mean diversification where diversification is beneficial. . . .

For those industries with diversified products, the new organizational concepts should evolve simpler channels through which to work with the Army, and less red tape.

For those whose product or service concerns only one individual Technical Service, over the long haul, the improvement will be in terms of the generally increased effectiveness of Technical Service operations. This improvement will stem from the attraction of highly qualified Army officers into logistics duties, and from the new incentive to manage well, because the performance of the mission can be more effectively measured.

It is our hope and expectation that these changes in Army organization will give us better tactical troops and operations, because officers whose primary interest lies in this field will no longer be saddled, in addition, with logistics duties. . . .

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CIVIL DEFENSE ACTIVITIES

GAS MASKS ON LOAN TO STATES

The Federal Civil Defense Administration announced in a recent press release that it is lending samples of gas masks, of the type approved for regional, state, and territorial civilian defense workers, to the various States.

The purpose of this is to enable the State authorities to familiarize themselves with this new item of civilian defense equipment developed by the Army Chemical Corps. Supplies of these masks may be obtained under the Federal matching funds program for $6-$7 each. It is stated that these masks furnish the same protection as the standard Army service mask. In addition to this mask, a lightweight mask intended for the civilian population generally and an infant protector have also been developed, according to the FCDA report.

FCDA HOUSING COMMITTEE

The national advisory committee to help develop plans and practical measures for the emergency housing and reception care of people in the event of an enemy attack on the United States, appointed by the FCDA, held its first meeting recently in the FCDA headquarters at Battle Creek, Michigan.

The committee is made up of various national organiations, associations, and government agencies which could help shelter and care for survivors in a national emergency.

TARGET CITY EVACUATION APPROVED BY SCIENTISTS

A Committee on Disaster Studies of the National Research Council, National Academy of Sciences, sponsored jointly by the Federal Civil Defense Administration, the Department of Defense, and the Ford Foundation recently reviewed and approved reports on the practicability of evacuating target city areas as a defensive measure. The reports were submitted by three teams of scientists appointed by the committee to study recent evacuation drills conducted in Mobile, Alabama; Spokane and Bremerton, Washington.

Moving the population of target cities out of town before attack can be and must be done to save lives when there is enough warning time the scientists stated, according to a recent announcement by FCDA.

Among the members of the committee were Dr. Bertrand Klass of Stanford University, Dr. John Rohrer of Tulane, Dr. John Balloch of Johns Hopkins, J. H. Mathewson of U.C.L.A., Dr. Hoyt Lemons of the U. S. Public Health Service, Willard Bascom of the National Research Council, and Harry Williams, technical director of the Committee on Disaster Studies.

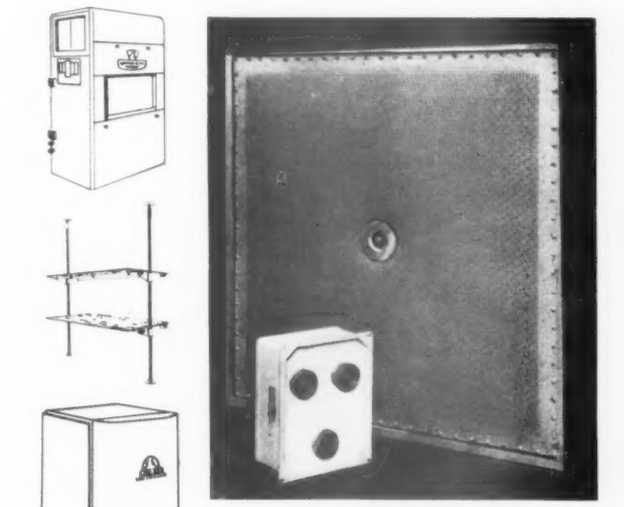
MATCHING FUNDS PROGRAM

In a recent publication entitled "Federal Contributions," which can be obtained from the Superintendent of Documents, Washington 25, D. C. for $1.25, the FCDA gives detailed information about the matching funds program for financing certain civilian defense equipment. It is pointed out that this fiscal year the Federal Government has available $13,300,000 toward meeting State requirements under this program wherein the Federal Government and States share the costs equally.

MEDICAL INSTRUCTION

An instruction pamphlet "Venipuncture and Intravenous Procedures," for use by doctors and nursing instructors in the training of nurses, nurses' aides, and practical nurses in intravenous procedures, has recently been published by the Federal Civil Defense Administration. The Administration states that in the event of an emergency situation where there were many casualties many persons other than fully qualified doctors would be called upon to perform basic medical functions such as blood transfusions and other medication of casualties.

The pamphlet may be obtained from the Superintendent of Documents, Washington 25, D. C. for 20 cents each.



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GENERAL CREASY "JOINS" THE PARATROOPERS

As the JOURNAL went to press information was received that Maj. General William M. Creasy, Chief Chemical Officer of the Army, had left for Ft. Campbell, Ky., to attend the 11th Airborne Division's Parachute School—the first two-star general to be enrolled. On this page are a picture of General Creasy and some recent U.S. Army photos pertaining to airborne operations training at various Army stations. Gen. Creasy expected to be away from his office for about two weeks.

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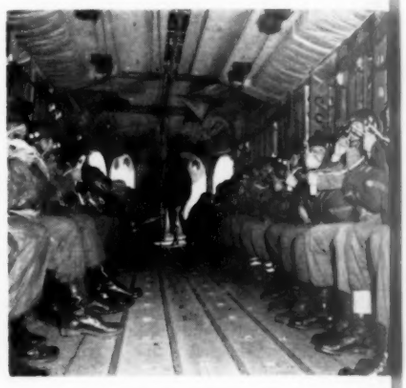

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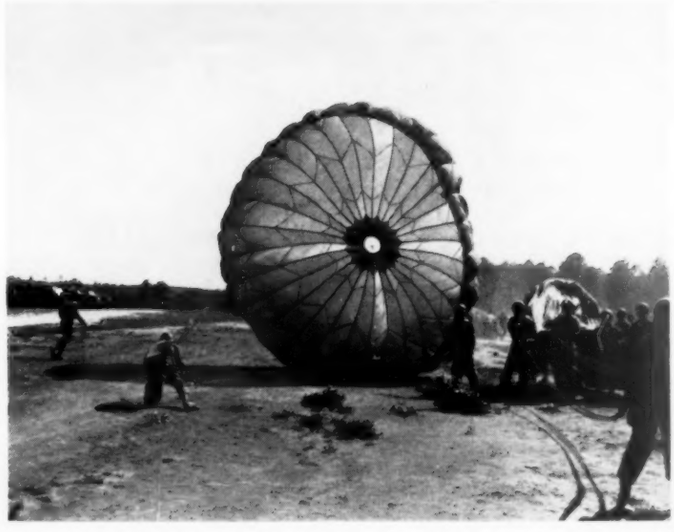

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1. Maj. Gen. Wm. M. Creasy.

2. 34-foot tower of 82nd A/B Div. Training Center is considered a most vital facility. The trainee must first qualify as a "trolley trooper."

3. Students of the 11th A/B Div. Parachute School, Ft. Campbell, Ky., assume the "get ready" position in a C-119 aircraft preparatory to jumping.

4. C-119's dropping paratroopers during mass jump at Fort Campbell.

5. Paratroopers of 88th A/B Antiaircraft Battalion float earthward in air-drop training at Ft. Bliss, Texas.

6. Scene at Basic A/B School at Ft. Bragg, N.C. Students must learn proper method of recovering from drag.

PARACHUTE LOGISTICS

Added meaning is given to Under Secretary Slezak's remarks on modern Army logistics (printed in this issue) as one contemplates these remarkable U.S. Army pictures, including the parachute dropping of a 2½-ton truck.

Loading a 2½-ton truck into a C-119 aircraft prior to heavy drop staged by the 11th A/B Div. at Fort Campbell. On rear of the truck can be seen the packs of the four giant G-11 parachutes used to accomplish the jumping of the vehicle. Behind the rear left wheels of the truck can be seen the extractor chute used to draw the vehicle out of the plane.

Sky full of G-11 one hundred-foot canopies during heavy drop operations carried out at Fort Campbell. In the center, still in the air, can be seen a 2½-ton truck dropped with the aid of four G-11 canopies. At the left is a ¾-ton truck coming down with two chutes, while on the ground, just landed, is a ¾-ton truck. A special quick release system is used which prevents the dropped vehicle from being overturned or dragged.

Breaking away the special rigging used to facilitate the dropping of this 2½-ton truck at Fort Campbell. The rigging is so constructed that it will distribute the shock of landing evenly throughout all members of the vehicle, making it safe to drop. This drop took place in 11th A/B Division training.

Another type of "airborne" logistics—An H-19-D Helicopter of 328th Helicopter Co., takes off with a 75mm howitzer in the infantry attack demonstration of the 10th Infantry Division at Camp Funston, Fort Riley, Kansas.

ROTC WINNERS OF AFCA AWARDS

Variety of extracurricular interests and activities as well as proficiency in both military and academic courses is reflected in the college records of the twenty-four outstanding ROTC cadets who received the AFCA Award (medal and scroll) this year. Herewith biographical sketches of twelve more of this group. Sketches of the other twelve were published in the November-December 1954 issue.—Ed.

GARY BROOKS, now a senior ROTC cadet at the Massachusetts Institute of Technology, had the distinction of being chosen as the top cadet in drill and leadership during his junior year at MIT. This leadership has also been reflected in his participation in the extracurricular activities at MIT. During his freshman year he received the MIT Freshman Scholarship and was a member of the Freshman Advisory Council and Freshman swimming team. He later received the MIT Undergraduate Scholarship and was a member of the Faculty Club Student Staff. His interests have also resulted in his being a member of the Rifle Team; MIT Guide Service; Kappa Kappa Sigma; and Scabbard and Blade, military honorary society. Cadet Brooks has also served as an announcer for Radio Station WMIT and as a sports director.

MARVIN E. ELLIS, JR. is an ROTC cadet at the Georgia Institute of Technology and has received the honor of being named a Distinguished Military Student as well as being placed on the Dean's list. He is majoring in chemical engineering and states, "It is the belief that the chemical field promises a future of still greater development and achievement. I have set my sights on the profession of chemical engineering." Cadet Ellis was born in Savannah, Georgia in 1934. During his junior year he was executive officer of the Pershing Rifle Club. He takes an interest in extracurricular activities at the Institute and is a member of Beta Theta Pi, Tau Beta Pi, Phi Eta Sigma, Phi Lambda Upsilon (chemical society), AICh.E, Circle K. Club, and the Scabbard and Blade.

JOHN R. HALL is majoring in chemical engineering at Vanderbilt University where he is an ROTC cadet. He was born in Dallas, Texas in 1932. He graduated from Knoxville High School, Knoxville, Tennessee, where he was a member of the football and track teams. Cadet Hall was co-captain of the University's football team in 1954. He is a member of the Sigma Chi fraternity; ODK, senior men's honorary society; and Tau Beta Pi, engineering scholastic fraternity. In addition to membership in these organizations, he is also a member of the American Institute of Chemical Engineers and is president of the local chapter and secretary of the southeastern group. Cadet Hall is Battalion Commander, 3rd Battalion, Vanderbilt University ROTC Regiment 1954-55.

JIMMY D. MAY, an ROTC cadet at the Agricultural and Mechanical College of Texas, received a four-year "Opportunity Award Scholarship" to the college upon graduation from the Breckenridge, Texas High School. Cadet May was born in Haworth, Oklahoma in 1933 but the family moved to Breckenridge when he was twelve years old. He held the rank of Cadet Staff Sergeant (Operations) during his junior year and in his senior year he has the rank of Cadet Captain, Special Service Officer. He is quite active in extracurricular activities at the college and is a member of the Ross Volunteers (honorary Company of Cadets, A & M College); student chapter, AICh.E; and Tau Beta Pi (honorary engineering fraternity); he is also interested in intramural sports, including horseshoes, tennis, and basketball. Cadet May states that he selected the chemical engineering curriculum because of his interest in chemistry and mathematics in high school. In addition, he was reared in the heart of the Texas-Oklahoma oil fields and has worked in a technical capacity for two different companies in the oil industry. He intends to make petroleum chemical engineering his specialty.

GEORGE H. MILEY, an ROTC cadet at the Carnegie Institute of Technology, was selected for the AFCA Award as the outstanding chemical engineering student in the ROTC unit. Cadet Miley was born in Shreveport, Louisiana in 1933. He is majoring in chemical engineering at the Institute and has been on the honor roll for three years. He is an active participant in school activities and has been a Dorm Councilor and member of the Dorm Council as well as president of the Student Council. Cadet Miley is a member of Scabbard and Blade; Kappa Sigma; Tau Beta Phi; ODK, senior men's honorary society; Delta Skull; and student chapter, AICh.E. He expects to be commissioned in the Chemical Corps in June 1955.

PAUL C. PICKENS, an ROTC cadet at Ohio State University, is majoring in personnel management and business administration in the College of Commerce at the University. His interest lies in the field of business management and its application to Chemical Corps activities. Cadet Pickens was born at Arlington, Ohio in 1933. His educational background, ability, interest, and leadership qualities were the governing factors in his selection of the Chemical Corps Branch of the ROTC. Cadet Pickens is a member of the College of Commerce Honorary Fraternity, Alpha Kappa Psi, Scabbard and Blade, and the CIVITAS.

JERRY E. WEIMANN, who is majoring in chemistry at the University of Illinois, holds the rank of Cadet Major in the Ordnance Corps ROTC Unit. He was born in Watseka, Illinois in 1933 and graduated from the Watseka Community High School. While in high school he was a member of the student council and the staff of the school year book and paper and was also active in band activities and football. Cadet Weimann is a member of Phalanx (an honorary, national military fraternity), the Ordnance Club, and the German Club. He states, "My choice of a career in chemistry was inspired by more than able guidance in high school and is being further augmented by college associations."

RICHARD KENNETH McLEOD is an NROTC midshipman at The Rice Institute. He is majoring in chemistry and hopes to fulfill a burning ambition to be a chemist, an ambition he has had since the age of twelve when he received a chemistry set for Christmas. Midshipman McLeod graduated with honors from West Columbia High School, West Columbia, Texas, standing number one in his class, and has maintained a high rating of scholarship while at The Rice Institute. He has made the Dean's list for the past three years and has been awarded Jesse Jones Scholarships for two consecutive years. Midshipman McLeod was offered scholarships to several universities and colleges upon graduation from high school. He states that he chose The Rice Institute in Houston, Texas because of the high rating of its chemistry department.

PHILIP M. PALMER received an NROTC scholarship at the University of Wisconsin and decided to major in chemical engineering because of his keen interest in chemistry and the current shortage of engineers. Midshipman Palmer was born in Lansing, Michigan in 1933 and attended the Lansing Eastern High School. He was very active in extracurricular activities while in high school, being president of the Honor Society and Latin Club; a member of the Student Council, Young Voter's Club, and the Junior Exchange Club. He was also captain of the bowling team and editor of the High School Year Book. At the University he was elected to Phi Eta Sigma and is a member of the Nautilus Society and the American Institute of Chemical Engineers, Student Affiliate. Midshipman Palmer participated in a training cruise aboard the U.S.S. Worcester this past summer.

RICHARD C. RUSSELL, NROTC midshipman at Georgia Institute of Technology, is majoring in chemical engineering. He states that chemistry has long been a field of interest and delight to him, especially wherein it is applied in turning waste material into new and useful products. Midshipman Russell was born in Cleveland in 1933. The family moved to Atlanta, Georgia in 1941 and he attended the North Fulton High School there, graduating in June 1951. Midshipman Russell is president of the student affiliate chapter of the American Chemical Society at Georgia Tech and is also a member there of Tau Beta Pi (Honorary Association for Engineers); Phi Lambda Upsilon (Honorary Chemical Society); and the American Institute of Chemical Engineers-Student Affiliate.

CHESTER J. PETKIEWICZ is an AFROTC cadet at the Lowell Technological Institute, Lowell, Massachussetts, where he has made an excellent showing in the Institute's academic program. He is on the Institute's staff as a part-time instructor of Quantitative Analysis. Cadet Petkiewicz is 20 years of age and resides at Dracut, Massachusetts where he was graduated from the Dracut High School. In addition to his academic interests, he has found the energy and time to participate in a variety of campus functions. He is an active member of the following organizations: Tau Sigma Epsilon, Phi Psi, Intra-Fraternity Council, Arnold Air Society, Nucleus, Newman Club, Lowell Tech Players, American Association of Textile Chemists and Colorists, Student Council, and Circle K. Club. Cadet Petkiewicz states, "I feel that chemistry offers more opportunities for advancement than any other field. In addition to the advancement possibilities, it offers the kind of problems that absorb both my interest and attention."

ADRIAN V. POLK is an AFROTC cadet at Mississippi State College and is majoring in chemistry. He received a John Rust Trust Fund Scholarship in 1953 and the William Flowers Hand Scholarship in 1954. Cadet Polk was born at State College, Mississippi in 1934. During his freshman year he was a member of Phi Eta Sigma, a freshman scholastic fraternity. He is presently a member of Lambda Chi Alpha, a social fraternity; Kappa Nu Epsilon, honorary math fraternity; and the Chemical Engineer's Club. Cadet Polk states, "I am interested in chemistry primarily because of the excellent opportunities available to graduates in this field. I think graduates in chemistry who have some advanced study have unlimited chances for advancement and recognition. I plan to enter graduate school as soon as possible and, on completion of three years of study, enter the field of chemical research."

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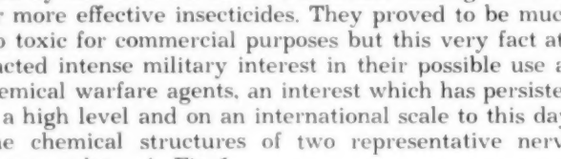
PROGRESS IN THE BIOCHEMICAL TREATMENT OF NERVE GAS POISONING*

By WILLIAM H. SUMMERSON, PH.D.

Chief, Biochemistry Division, Chemical Corps Medical Laboratories, Army Chemical Center, Maryland

THE GOAL OF MEDICAL research in the field of chemical warfare is the prevention and treatment of casualties from toxic chemical agents. To reach this goal, the Chemical Corps and the Medical Department of the U. S. Army maintain the Chemical Corps Medical Laboratories at the Army Chemical Center, Maryland. Here a competent staff of scientific investigators in the medical and allied fields study all phases of the effects of toxic chemical agents on man and on animals, to arrive at a sound knowledge of the mechanism of toxic action and to translate this knowledge into practical and effective procedures for prophylaxis and therapy against toxic chemical agents.

One of the outstanding problems in this field has been the development of medical defense against the so-called "nerve-gases." The nerve gases refer to a group of highly toxic organic phosphorus compounds, which are actually volatile liquids rather than gases, and which were found in the possession of the Germans at the close of World War II. These compounds were originally discovered by the German chemist Schrader during a search for more effective insecticides. They proved to be much too toxic for commercial purposes but this very fact attracted intense military interest in their possible use as chemical warfare agents, an interest which has persisted at a high level and on an international scale to this day. The chemical structures of two representative nerve gases are shown in Fig. 1.



(a) (b)

Fig. 1. Chemical Structures of Two Nerve Gases (a) "tabun"; (b) "sarin"

The mechanism of toxic action of the nerve gases is well understood, at least at the cellular level. Nerve gas has an extraordinary and almost specific ability to react with, and inactivate, the enzyme *cholinesterase*, located in nerve tissue and in other important body tissues. The function of this enzyme is to destroy a substance called acetylcholine (Fig. 2). Acetylcholine, somewhat like adrenaline and histamine, is a very powerful drug which

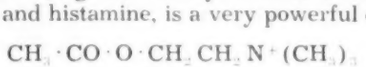


Fig. 2. Structure of Acetylcholine

is produced in small amounts by certain body tissues as a part of their normal functioning. As a measure of control over the amount of this highly active substance present at any one time, nature has provided the body tissues with the enzyme cholinesterase, which as stated above destroys acetylcholine almost as rapidly as it is produced and thus prevents the accumulation of an excess of acetylcholine in the tissues. In nerve gas poisoning, the enzyme is rendered inactive by reaction with the nerve gas. In the resulting absence of normal control over the concentration of acetylcholine produced by nerve action, excessive amounts of acetylcholine accumulate in the nerves and elsewhere, leading to abnormal functioning of the nerve system. This may be sufficiently severe to result in death, as for example by paralysis of the nerves which control respiration, thus leading to a cessation of breathing and eventual death from a lack of oxygen.

If the accumulation of abnormal amounts of acetylcholine is responsible for the symptoms of nerve gas poisoning, a drug which counteracts or blocks the action of acetylcholine should be effective in the treatment of nerve gas poisoning. Among the many drugs which have been studied in this connection, atropine appears to be the most satisfactory and in fact is the standard drug presently recommended for the treatment of nerve gas poisoning (1). If treatment with atropine is combined with some method of artificial respiration, even severe cases of nerve gas poisoning may be successfully treated.

It is clear, however, that there are other possible approaches to the problem of nerve gas poisoning, and it is these approaches, essentially biochemical in nature, which will be discussed in detail here. If the action of nerve gas is to inactivate the important enzyme cholinesterase, leading to the events described above, there is at least a theoretical possibility that a drug which reactivates the enzyme (if it does so soon enough) will be useful in therapy, since once the enzyme has been reactivated it will perform its normal function of destroying the accumulated acetylcholine, and the symptoms of poisoning should disappear.

There is some biochemical basis for this approach. In lewisite poisoning, for example, there is good reason to believe that the lewisite reacts with certain components of the skin to produce altered molecules which are responsible for the resulting skin damage and blistering (2). If the substance BAL ("British Anti-Lewisite") is applied to the skin even after the lewisite has penetrated and reacted with skin substances, the BAL likewise penetrates the skin, reacts with the altered substances to remove the bound lewisite, and leads to the regeneration of normal skin substance. Thus no damage results under these conditions, because the biochemical lesion produced by the lewisite has been reversed by the BAL. In the case of nerve gas poisoning, the application of similar reasoning leads to the conclusion that, if a drug could be found which would remove the bound nerve gas from the cholinesterase molecule, the activity of the enzyme would be restored and the signs of toxicity should disappear.

* This is a non-technical summary of certain recent work on the treatment of nerve gas poisoning at the Army Chemical Center. The many technical details of the work summarized here will be found in articles now being prepared for publication in various scientific journals. The author is indebted to the following members of the staff of the Chemical Corps Medical Laboratories for permission to use some of their experimental data: Dr. B. J. Jandorf, Dr. T. Wagner-Jauregg, Dr. G. Steinberg, Dr. R. Plapinger, Dr. G. Freeman, Capt. M. Epstein, MC, Mr. M. Stolberg, and Mr. B. Hackley, Jr.

There is still an additional method of approach to the problem of nerve gas poisoning, which is somewhat different from that just described. The nerve gas is absorbed from the lungs or through the skin into the circulating blood, where it is carried to various sensitive tissues such as the brain and other parts of the nervous system. It is conceivable that a drug may be found which can be administered beforehand, which will circulate in the blood, and which will react with and destroy the entering nerve gas before it gets a chance to reach the nervous tissue. This approach is illustrated for bacterial diseases, for example, by the sulfa drugs and penicillin, where the effectiveness of these drugs is based on the maintenance of a sufficient concentration in the circulating blood and tissue fluids to keep the bacteria in check.

In considering these two biochemical approaches to the problem of nerve gas poisoning, we could see no particular reason to favor one over the other, since there was no evidence available in direct support of either approach. We therefore decided to pursue both approaches. On the one hand, we were looking for substances which would produce a regeneration of activity in cholinesterase inactivated by reaction with nerve gas. On the other hand, we sought substances which would react rapidly with the nerve gases under physiological conditions, be relatively harmless if taken internally, and be effective in reasonable doses.

It can be readily understood that this search has been full of disappointments. Chemically speaking, the nerve gases are surprisingly unreactive molecules. They are completely detoxified by hydrolysis in water, but this process is far too slow to be of any practical value in overcoming their toxic effects. If alkali is added to the water, hydrolysis is accelerated, and in fact a strongly alkaline solution is a very effective decontaminating solution for liquid nerve gas. But such alkaline solutions can only be used on inert material like glass and metal; they cannot be taken internally or injected into the blood, nor can they be used on the skin or eyes. What we were searching for was something which would not harm delicate tissues and which would react with and detoxify nerve gases in a matter of minutes at the most.

The first "break" in this search came when Dr. B. J. Jandorf found that the substance *hydroxylamine* (Fig. 3) met some of our requirements. In a report published

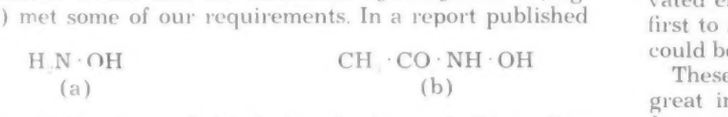


Fig. 3. Structures of (a) hydroxylamine, and (b) acethydroxamic acid, a typical hydroxamic acid.

in 1951, which still contains classified details, Dr. Jandorf showed that dilute solutions of hydroxylamine reacted rapidly and smoothly with nerve gas solutions, under physiological conditions, to detoxify the nerve gas. In one experiment, for example, it was found that one-half of the nerve gas present was destroyed in five minutes in the presence of hydroxylamine, whereas without the added hydroxylamine it required almost sixty times as long to get the same degree of detoxification.

These results were extremely interesting, since they showed that it was possible to find compounds which would react with nerve gas and destroy it under conditions similar to those found in the blood. However, hydroxylamine is itself appreciably toxic, it reacts with many substances other than nerve gases, including substances found normally in the body fluids, and studies of the rate of reaction indicated that hydroxylamine could not be expected to react sufficiently rapidly with nerve gas entering the blood to be of any practical value.

The next advance was made by Dr. T. Wagner-Jauregg and his group of organic chemists. They searched for some modification of the hydroxylamine molecule which would have less toxicity and a more rapid rate of reaction with nerve gas. Early in 1953 this group found that compounds of the class known as hydroxamic acids (Fig. 3) appeared to possess desirable qualities. The hydroxamic acids are relatively non-toxic, they are chemically quite stable, and they are capable of reaction with nerve gas at a much more rapid rate than does hydroxylamine. Dr. Wagner-Jauregg and his group synthesized a number of hydroxamic acids and established the chemical nature of their reaction with the nerve gases. This reaction appeared at first to be a catalytic hydrolysis, since the nerve gas molecule is hydrolyzed in the reaction to give the non-toxic hydrolysis products. However, careful study of the reaction indicated that the first step in the reaction was a direct combination between nerve gas and hydroxamic acid, followed by a further reaction in which the nerve gas molecule was split off and hydrolyzed, the hydroxamic acid residue undergoing further reactions to give a final product which was isolated and identified.

The details of this work were described in a classified report, of which a portion has subsequently been released for publication in the open literature (3). It is of interest to note that a paper appeared from Northwestern University at about this time, by C. J. Hurd and L. Bauer (4), which reached essentially the same conclusions as those of Wagner-Jauregg *et al* (3) concerning the fundamental mechanisms of the hydroxamic acid reaction.

During the course of the work on hydroxamic acids, the interesting paper of Wilson and Meislich (5) appeared from Columbia University. In this article, these authors reported for the first time the successful regeneration of activity of DFP-inactivated cholinesterase by treatment with dilute solutions of certain hydroxamic acids *in vitro*. Previous reports from the same laboratory (6) and elsewhere (7) had been concerned with the regeneration of activity of TEPP-inactivated enzyme, which however is much easier to effect and indeed occurs spontaneously, if slowly, if the inactivated enzyme is allowed to stand in water for a sufficiently long time. However, the DFP-inactivated enzyme is resistant to procedures which lead to activation of the TEPP-inactivated enzyme, and in fact Wilson and Meislich were the first to show how inactivation of cholinesterase by DFP could be overcome *in vitro*.

These experiments by Wilson and Meislich aroused great interest at Edgewood, and it was easily possible for us to repeat them and confirm them, in general if not in specific detail. The question then arose as to whether or not the hydroxamic acids would be effective against cholinesterase inactivated by nerve gas, since although there are many similarities between DFP and nerve gas, there are also significant differences in biochemical reactivity between them. We found that under the proper conditions the hydroxamic acids used by Wilson and Meislich are effective not only against DFP inactivation but also against nerve gas inactivation of cholinesterase.

It then became of obvious interest to try out the hydroxamic acids in animals, to see if they would protect against nerve gas poisoning, since we had shown that they would detoxify the nerve gases and Wilson and Meislich had shown that they would produce a regeneration of cholinesterase activity, at least in the test tube, after the enzyme had been inactivated by DFP.

The animal experiments were carried out by Dr. Freeman and Capt. Epstein, using mice. It was first necessary for Drs. Freeman and Epstein to establish the maximum dose of hydroxamic acid which the mice would tolerate, to avoid any complications from a toxic effect of the drug itself. The drug was then administered at a level well

below the maximum tolerated dose, followed by a lethal (LD50) dose of nerve gas. The control animals were given the nerve gas alone. The results were very satisfactory. In one experiment, for example, out of a group of 24 control animals given the nerve gas alone, about half of the animals died, which was as expected from the amount of nerve gas administered. In the group previously treated with the hydroxamic acid, however, *only 1 animal out of 24 died*. These experiments have been repeated many times, with exactly the same results.

One might ask at this point whether the hydroxamic acid is protecting the mice because it destroys the nerve gas in the blood stream or because it promotes a regeneration of cholinesterase activity in vital tissues, or both. It is not clear from these experiments which mechanism is concerned, and further study is required to clarify this point.

Another question concerns the practical value of hydroxamic acids in nerve gas poisoning. On the basis of present knowledge, it may be concluded that the hydroxamic acids do not appear to be too promising for the treatment of nerve gas poisoning in man. Although they are not too toxic, rather large doses are required for protective action. From the results on mice, it may be calculated that from 20 to 30 grams of the most effective compound would have to be administered intravenously to man to afford demonstrable protection against nerve gas, and even this amount is a guess, based as it is upon the unlikely assumption that man and mouse are similar in their responses to both nerve gas and drug.

At the present time, it is concluded that the hydroxamic acids offer much less promise for the victim of nerve gas poisoning than does the drug of choice, atropine. Atropine has saved the lives of many men who have been exposed accidentally to insecticides and other compounds of the nerve gas type, and of at least three men who have been accidentally exposed to nerve gas itself. When atropine is administered promptly and is supplemented by artificial respiration, man can be saved from several lethal doses of nerve gas.

These conclusions do not militate against the fundamental value of the results described here. A most important point has been established, and that is the possibility of internal treatment of nerve gas poisoning by drugs which do not act solely to relieve the symptoms of poisoning but actually destroy the toxic factor concerned. The next step, from possibility to practicality, is merely a matter of continued research.

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DR. GIBSON'S LABORATORY RECEIVES NAVY AWARD

The Applied Physics Laboratory of Johns Hopkins University, Silver Springs, Md., of which Dr. Ralph E. Gibson, who is First Vice President of AFCA, is the Director, was recently given the Naval Ordnance Development Award for "continued outstanding scientific achievements since 1945 and in appreciation of exceptional service to Naval Ordnance Development."

This is the second such award received by the Laboratory, the previous one having been extended to it in 1945 largely for its work on proximity fuses for shells. Since then the Laboratory has been engaged in research and development of guided missiles for the Navy.

In a letter to Dr. Gibson referring to the second award, Rear Admiral Malcolm F. Schoeffel, Chief of the Navy Bureau of Ordnance, stated that the work of the Laboratory has "reflected the highest scientific ability." The letter states further, "This high degree of technical competence has continued to be displayed through the post World War II period, through the Korean emergency and on up to the present day. The contribution by the Applied Physics Laboratory to the wind tunnel and High Altitude Test Facility at the Ordnance Aero Physics Laboratory at Daingerfield, Texas has been outstanding. The technical work on the development of the AEROBEE sounding rocket, the development of the FM/FM telemetering system and the continued development of certain guided missiles which have promise of becoming highly important additions to our naval weapons has been excellent in all respects."

SPARE PARTS PROCUREMENT

By COLONEL GEORGE W. DORN

Director, Publications Department,

Chemical Corps School

THE PROCUREMENT of spare parts for Chemical Corps end items is an important function of Chemical Corps procurement districts both from the standpoint of its importance to the defense effort and to the economy of the nation. An explanation of some of the terms used in discussing procurement will be helpful.

Procurement is the process of obtaining personnel, services, supplies, and equipment, including, as applicable, design, specification, standardization, conservation, selection of contractors, contract forms, pricing, renegotiation, financing, contract termination, and similar functions.

An *end item* is a completed functional unit of equipment usually constructed by assembling many components or parts.

Spare parts are essential duplicates of those parts of an end item requiring replacement to maintain it in a proper functioning order. Some parts of an end item last for the lifetime of the end item; other parts must be replaced frequently or occasionally—as their life span falls short of that of the end item.

Types of procurement orders. Essentially, two types of orders are used to procure spare parts: (1) the procurement order for concurrent spare parts production and (2) the procurement order for spare parts only.

Procurement order for concurrent spare parts production. This type of order includes spare parts procurement and delivery into the Army supply system concurrently with the procurement and delivery of the end item. These spare parts are usually procured in quantities determined from engineers' estimates to provide for maintenance support covering the period between the initial issue of the end item and the time when spare parts supply requirements records are established. When supply records or usage factors are established, subsequent spare parts replacement orders follow a normal procedure and bring into operation the second type of procurement order for spare parts.

Procurement order for spare parts only. This type of order covers the procurement of spare parts only. No end item is included. These spare parts may be commercially available or may require manufacturing.

Advantages of procurement order for concurrent spare parts:—

(1) Makes spare parts immediately available for maintenance wherever the end item is. (The spare parts are produced and delivered simultaneously with the end item for shipment to depots, theaters, or commands.)

(2) Spare parts are procured at the lowest cost because production is in full operation.

(3) Requires very little additional effort to place and follow through inspection and processing. (The major portion of the work involves procurement of the end item; usually an end item is supplied by one primary contractor and involves only one contract with one manufacturer and having one inspection location.)

(4) Administration and paper work for the procurement district are reduced to a minimum; primary contractors who subcontract for parts with other manufacturers are responsible for any additional processing or paper work thereby entailed.

—U. S. Army Photo

COLONEL GEORGE W. DORN

The author, Colonel George W. Dorn, is president of the Ft. McClellan, Ala., chapter of AFCA. He has had extensive experience in Army procurement, having served in the New York Procurement Office of the Chemical Corps, as commander of both the Dallas and the San Francisco Procurement Districts, and as Chief of the Procurement Planning Branch, Office of the Chief Chemical Officer. His troop unit assignments have included duty as Corps chemical officer, assistant Army chemical officer, chemical mortar battalion commander, and duty with the U. S. Constabulary in Germany. He returned from Europe in July 1949, following 42 months overseas service.

Colonel Dorn has a B.S. degree in chemical engineering. He is a graduate of the Chemical Corps School (Basic and Advanced courses), the Army Industrial College, the Command and General Staff College, and the Armed Forces Staff College. He started his military career in the New Jersey National Guard.

Advantages of procurement order for spare parts only.

(1) Eliminates the prime contractor or middle man and his profit. (Replacement spare parts are usually procured from many regular commercial sources or are made by several manufacturers because they have been previously awarded con-

tracts either through advertising bids or by negotiation.)

(2) Saves considerable time and money for the Government, since contractors are previous end item suppliers and have experience on which more accurately to base their cost estimates and production.

Determining quantity requirements for spare parts. A procurement district starts procurement action when it receives a spare parts procurement requisition from the Chemical Supply Officer of the Memphis General Depot or a procurement order from the Chemical Corps Materiel Command. The Chemical Section of the Memphis General Depot stocks spare parts for the entire Chemical Corps. As soon as the order is received, the district proceeds to procure the item or items requisitioned. The computations for spare parts requirements are developed from basic data obtained from the following sources: active Army, oversea commands, continental armies and civil components, depot maintenance (both Army and Air Force), special reserves, engineers' estimates for new spare parts items, modification work orders, and USAF spare parts. For example: Before an end item is issued or used, engineering estimates are made covering the probable life of each of its parts. Concurrent type procurement orders are then made up, the quantities required being based on the engineers' estimates. Later on, from the actual issue experience gained from use of the end item and its maintenance in the field, more accurate spare parts requirements figures are obtained and assembled. From these figures can readily be calculated the number of parts which must be provided as spares to maintain any given quantity of an end item in proper functioning order for any period; and procurement orders can be prepared covering the spare parts requirements only.

Obviously, once an end item becomes inoperative because of malfunctioning or breakage of any one of its parts, the end item itself becomes an economic loss unless the impaired part is readily available to maintain it. Such *economic* loss, however, becomes insignificant compared with the *casualty* loss of our fighting men—a loss which is unnecessary when either totally or partly caused by our failure to provide the essential parts so necessary for equipment maintenance.

The spare parts procurement system serves the defense effort and the national economy by processing spare parts wisely and delivering them to maintenance areas promptly so that existing end items can be currently kept in operating condition over a long period of time.

The Chemical Corps Materiel Command recognizes the importance of providing adequate quantities of spare parts wherever they are needed. Early in 1952 the procurement of spare parts by and through the San Francisco Chemical Procurement District became a major activity and accounted for a large portion of its work program. During the fiscal year 1 July 1952 to 1 July 1953, 62 contracts were processed amounting to $670,900 for the M2A1 smoke generator alone.

Located strategically throughout the United States are six Chemical Corps procurement districts, whose over-all mission is the same: to procure Chemical Corps items (chemical warfare material) for the Armed Forces. They employ similar procurement procedures, differing only in the type and kind of item procured. Each of the six procurement districts cooperates with the other five on a nation-wide scale. Thus, if the San Francisco Chemical Procurement District contracts for an item — say the crankshaft, a spare parts item needed for the M2A1 smoke generator — with the Quaker City Motor Parts Company, Philadelphia, Pennsylvania (a contractor in another district), the district within which the contractor is located (in this case, the New York Chemical Procurement District) will, when requested, provide a Pre-Award Survey and Inspection Service to the San Francisco District.

Before tracing the sequence of steps involved in procuring an item from a typical district, it might be well to clarify some of the more important procurement terms. Terms and procedures applicable to all Chemical Corps procurement districts (formal advertising, negotiation, Invitation for Bids, small business, contracting officer, opening and award of bids, and rejection of bids) are defined or explained below.

Formal advertising, or "advertising," for military procurement entails "the preparation of invitations for bids, the publication and distribution thereof to prospective bidders, public opening of sealed bids, and award to the lowest responsible bidder." Advertising is usually used as required by the Armed Services Procurement Act of 1947. Negotiation may be used provided sufficient justification is available.

Negotiation, as used by the Armed Forces, means any method of contracting for the purchase of supplies or services under which the procedures for procurement by formal advertising are not followed. The objective is the same as in formal advertising: to obtain the required supplies and services in a manner which will best serve the interests of the Government. As an example, negotiation would be justified in a case where the delivery date is too near to allow sufficient time for advertising for bids. In such an event, the district's Industrial Division (in the case of the San Francisco Chemical Procurement District) would select the best qualified suppliers and complete negotiations directly with them in order to obtain delivery of items in accordance with the required delivery dates and at the lowest cost obtainable by negotiation.

Invitation for Bids is the name given to a standardized, printed Government form that has (in addition to "terms and conditions of the Invitation for Bids" printed thereon) three main parts:

Invitation (by the Government) *for bids.*

Bid (bid is made by the bidder or seller, who completes this portion, including inserting prices).

Acceptance of bid (portion filled out and signed by the contracting officer in accepting the bid).

The description of the spare parts or other supplies or services for which bids are invited should be clear, complete, and worded so as to invite full competition. A separate Invitation may be issued for each class of material. The specifications cited in the Invitation for Bids should be standard Government specifications or, if none are available, tentative specifications. If no specification is available and the preparation of a specification is not justified, a drawing or a description, containing all of the essential requirements to be met by the article for which a bid is sought, should be furnished. As an expedient only, if there is no available specification and if no description of the article can be furnished, then and then only the item can be described by the name of one or more makes of the item. The name must be followed by the words "or equal." (Note: For many spare parts of commercial items, no drawings are available, and the above expedient is used.) The product of any reputable manufacturer producing items of the type specified will be considered regardless of minor differences—provided all such differences are specifically enumerated and all essential requirements are met. In other words, the Invitation for Bids and the specifications must permit bidders to compete on a common basis. Restricting specifications to a particular brand or make of product tends to exclude other manufacturers of the same type of prod-

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uct from bidding. This type of specification is improper (even though it may aid the Government in effecting economies in spare parts inventory).

Copies of the Invitation for Bids should be furnished to a sufficient number of sources to encourage full and free competition. The extent of distribution is within the discretion of the contracting officer. These sources are obtained from the bidders' list maintained by the procurement officer or, if that does not contain a sufficient number of sources, from Thomas' Register, the Classified Telephone Directory, or similar sources.

It may sometimes not be practicable to use every name on the active bidders' list for every invitation. During normal times, when there is a buyer's market, a great many sources usually request that they be placed on the bidders' list. For instance, a bidders' list may contain over 100 sources for oil filters or for paint. If the requirement is for a small quantity, it would seem reasonable to send the invitation to possibly 10 sources. On the next requirement, the next 10 to 20 names on the list would be used.

A *small business* is defined as one whose employees, including affiliates, number less than 500. It is the declared policy of Congress that small business should receive a fair proportion of total procurement and that consideration should be given to alleviation of unemployment in distressed employment areas. (This policy has enabled small business to obtain contracts covering a major portion of the spare parts procurement placed through the San Francisco Procurement District.)

A *contracting officer* is one of the officers or civilian employees appointed solely by the Chief Chemical Officer. He has the authority to commit the Government by contract. He represents the Government in the execution of contracts and is required personally to sign all contracts and supplemental contracts. He is required to administer a contract and see that the Government is protected thereunder and that the contract is performed according to its terms.

Opening of bids. All bids must be publicly opened at the time and place stated in the advertisement. Bidders or their representatives may be present at the opening of bids and may be permitted to inspect a copy of bids submitted.

Recording of bids. The contracting officer or his representative opens and numbers serially one copy of each bid received and retains this copy in his possession until the names of the bidders and the prices bid are entered in an abstract or record (available for public inspection), and certified by him. Bids are customarily recorded on a standard form, which is prepared in advance of opening and which lists the invitation number and description of items.

Procurement procedures. Let us now trace the steps involved in procuring a spare part by a typical Chemical Corps procurement district, the San Francisco Chemical Corps Procurement District.

The San Francisco District receives from the Chemical Supply Officer of the Memphis General Depot a requisition for spare parts to be procured by the San Francisco District as assigned the Chemical Corps Materiel Command in accordance with the commodity procurement assignment list. These requisitions are prepared by the Depot usually on a quarterly basis. The requisition gives the nomenclature of the requisitioned items, quantity required, estimate of costs, funding information, point of inspection and delivery, and requested date of delivery. The district's Industrial Division checks the requisition for deviations in nomenclature, parts numbers, specifications, and costs before any purchase action is taken.

If the item to be procured is a commercial type item, a check is made to ascertain whether an open-end or call type contract can be utilized. An open-end contract is an agreement for supplies which contains no or varying limits of time and quantity and which involves recurring orders and charges in varying degree. Such contracts are used where industrial practices give assurance of supply and make such contracts feasible and economical, where economies in transportation may result, and where a continuing or recurring demand exists for the item under procurement.

A review is then made of the district's active bidders' list. This list is composed of the names of potential suppliers or prospective bidders, i.e., past suppliers of material and those who have indicated their desire to supply the Government with the materials required. It includes both large and small business. To each name on the bidders' list, if practicable, is sent an Invitation for Bids, which includes the complete list of each spare part, delivery dates, etc. The complete list is sent to enable each prospective bidder to bid on each spare part if he desires or to bid on any one or more. When bids on all items are received in accordance with the time and place stated in the advertisement, they are publicly opened and recorded and award is tentatively made—pending a satisfactory Pre-Award Survey—to the lowest responsible bidder or bidders. A Pre-Award Survey is then made of the lowest bidder. It includes investigation as to his financial and technical manufacturing abilty to produce the items on time and in the quantity desired. The survey particularly includes investigation of his abilty to produce with finances on hand or readily available. One purpose of the survey is to determine what effect the award of a defense contract might have on the contractor's organization (if it is an additional defense contract, whether it will adversely affect his performance of contracts already awarded and his backlog of unfilled orders) and to investigate his past performance. The survey also checks such things as the contractor's know-how, engineering ability, inspection, and machinery and personnel available. If the Pre-Award Survey is satisfactory, an award is made. Contracts are then drawn up with the contractor by the San Francisco District for execution by the contracting officer. The unsuccessful bidders are notified by mail.

After the contract has been awarded, the procurement district's representatives cooperate with and assist the contractor in every way possible; for example, by giving engineering assistance needed to overcome production obstacles or by aiding in locating and obtaining necessary production equipment or raw materials. These cooperative services are made available to the supplier to assure delivery of each type of item to its destination on the dates specified and in quantities agreed upon in the contract.

Inspection Division. The Inspection Division of the Procurement District sets in motion a series of actions which result in a smooth operation when the item is submitted for acceptance. Even before the contract has been awarded, the Inspection Division is a party to a Pre-Award Survey. A Pre-Award Survey for inspection is necessary because the spare parts procurement program is directed primarily toward small businesses, many of which have had no previous contracts with the Government. Because of their inexperience, it is advisable for the district to make a Pre-Award Survey to determine whether or not the small business can handle the contract. It is the responsibility of the Inspection Division to determine whether the company has adequate inspection facilities and maintains a suitable quality control system. If a contractor's quality control system is not satisfac-

tory, the Inspection Division gives him technical assistance and maintains his quality control and inspection records. Such assistance also enables the Inspection Division to survey the inspection facilities and determine where and how it will perform its own inspection.

If the contractor to whom a contract is awarded is located in the San Francisco District, that district's inspectors will do the inspecting. If the contractor is located in another procurement district and source inspection is deemed necessary, the contract-awarding district (San Francisco) draws up an Inspection Requisition on that district to do the actual inspection. Conversely, if another procurement district has a contractor in the San Francisco District, the other district may write an Inspection Requisition on the San Francisco District to do the inspecting in the latter's district. Or, a district may request the Navy, Air Force, or other technical service of the Army to inspect the item if the service already has an inspector at the plant. This is possible through the Inspection Interchange Agreements of the Armed Forces. Whichever service has a resident inspector at a plant usually inspects all items coming from that plant on all Department of Defense contracts.

When the contract is let, the Inspection Division reviews the contract to determine what inspection tests are specified, how much time an inspector may have to spend at the plant, what gages or special testing equipment are necessary, and what packaging is specified. A check is then made to determine whether the gages or special equipment are available in the district. If they are not available, the Inspection Division requisitions the items necessary for the required inspection from the Inspection Equipment Agency, Army Chemical Center, Maryland. Even if the contract is to be inspected outside the district, it is the responsibilty of the contract-awarding district to arrange for the supply of gages or special inspection equipment.

The Inspection Division contacts the contractor and informs him of the inspection tests, packaging, and markings specified in the contract, and furnishes details concerning the set-up and performance of these tests.

Several contractors often are awarded contracts for portions of the spare parts items listed on a single Invitation to Bid. In such instances one inspector is responsible for inspecting the production of several contractors, and he allocates his time so that he is available when the finished item is ready for inspection. On small-volume items, the Inspection Division prefers to inspect the entire amount at one time, with a minimum number of inspection visits. Other items may require occasional or continuous inspection during production to insure a high quality of production. Inspections during production protect the contractor; even an occasional spot check may detect an item that fails to meet the specifications and enables the contractor to halt production temporarily and correct the mistake or cause of the deficiency before the entire order is ruined.

The San Francisco District maintains resident inspectors in Los Angeles to inspect items procured in that area. If an area has too few contracts to maintain a full-time resident inspector, the district office sends that area an inspector as needed .

Contracts for spare parts are usually written either f.o.b. the contractor's plant or f.o.b. destination (which is usually the Memphis General Depot). F.o.b., as related to delivery of material sold, means the point where title to the goods passes from the seller (contractor) to the buyer (Government). The risk of loss or damage in transit is borne by whoever has title to the goods at the time of such loss or damage. If shipped "f.o.b. contractor's plant," the item is inspected and accepted at the plant by the inspector from the Inspection Division. Here, the Government (buyer) assumes title at the plant and pays the cost of transportation from plant to point of destination. If shipped "f.o.b. destination," the item is inspected at the contractor's plant by the Inspection Division as per contractual requirements, and final acceptance is made at destination. In this case the title to the goods does not pass to the buyer (Government) until the goods reach the designated destination and the contractor (seller) pays the freight costs from point of shipment to point of destination. If the item is shipped from the contractor directly to a port of embarkation, the Inspection Division makes the inspection and acceptance before it is shipped.

In addition to inspecting the finished spare part, the Inspection Division checks to see that the packaging, packing, and marking are accomplished as prescribed in the contract and referenced specification. It also interprets these requirements and gives other technical assistance to the contractor.

To show the scope of procurement involved in the procurement of spare parts for one end item, a partial list of the contractors who have been awarded contracts for spare parts for the M2A1 smoke generator over the past year* is given below:

Name	Address	Item
Besler Corporation	Emeryville, Cal.	Thermostatic valves, smoke generator parts
Clayton Mfg. Co.	El Monte, Cal.	Tank and air casings, smoke generator parts, engine parts
Hart-Carter Co.	New Holstein, Wis.	Lauson 1½-hp engines, engine parts and accessories
Ball Bearing Co.	San Francisco, Cal.	Flue pans, tank and air casing assemblies, M-11 valves, miscellaneous smoke generator parts
McCune-Merifield Co.	San Francisco, Cal.	Lauson engine parts
Tillotson Mfg. Co.	Toledo, Ohio	Carburetors
Whitney Chain Co.	San Francisco, Cal.	Sprockets, chain assemblies
Die & Tool Products Co.	San Francisco, Cal.	Diaphragms, valve stems
California Canvas Co.	Los Angeles, Cal.	Canvas cover
Wico Electric Co.	West Springfield, Mass.	Magnetos and parts
Quaker City Motor Parts Co.	Philadelphia, Pa.	Crankshafts, pistons, piston pins, bearing cleaners, canvas covers, connecting rod assemblies, etc.
Arrow-Hart & Hegeman Electric Co.	Hartford, Conn.	Switches
Southern California Plating Co.	Los Angeles, Cal.	Manifolds
Amersil Company, Inc.	Hillside, N. J.	Quartz rods
Wagner & Niehaus	San Francisco, Cal.	Button elements and manifolds
Industrial Precision Products Co.	Chicago, Ill.	Thermostatic fuel valve assembly
Chieftain Mfg. Co.	New York, N. Y.	Manifold outlet assembly
Turlock Sales Co.	Turlock, Cal.	Lauson engine parts
Crane Co.	San Francisco, Cal.	Valve, fittings
Roper Pump Co.	Rockford, Ill.	Oil pumps
The Adam-Hill Co.	San Francisco, Cal.	Connectors
Cuno Engineering Co.	Meriden, Conn.	Oil filters

(Continued on page 33)

*1953

THE Savannah River Project

SAVANNAH RIVER PROJECT is the name of the gigantic undertaking to provide for the government a plant for the manufacture of material for both atomic and thermonuclear weapons or H-bomb weapons.

The word "plant" seems scarcely a suitable one to apply to this vast engineering enterprise in South Carolina on the Savannah River 15 miles south of Aiken. The plant site itself, 200,000 acres, is four times the size of the District of Columbia. Its selection involved consideration of a required electric power system comparable to that of the state of Delaware and a water consumption approximately equal to that of the city of Philadelphia. Thus, such figures about the project as have been revealed strain the imagination. Not the least of them in this respect are those given for the "ultimate cost" of the project, or "around one billion, three hundred million dollars." These facts and more interesting information about the project and the role of the E. I. duPont deNemours Company, Inc., which took on the work of designing and constructing the plant at the government's request and set its own fee as $1.00, were contained in a speech before the Rotary Club of Wilmington, Delaware on November 18, 1954, by Mr. Granville M. Read, chief engineer of the DuPont Company.

Some idea of the magnitude of the problems involved in this undertaking may be gained from Mr. Read's remark: "As a scientific and engineering achievement, harnessing energy like that generated in the stars is without precedent. It demonstrates what can be accomplished when science, business, and labor willingly join hands at government request for the defense of America and the free world. It reflects the complementary responsibilities of big and small business in serving our free economy—and the people of our country."

Speaking of the cooperative efforts involved in the enterprise Mr. Read stated, "The history of the Savannah River is convincing proof that in an expanding world we need big institutions for big tasks. . . . When our government mobilizes men and material for defense efforts it turns first to the big industries, steel, metals, motors, electric power, chemicals, machine tools, transportation, and many others. It uses them as a foundation on which to build the entire defense structure, for only they have the capacity in technology, men, management, and machines to undertake big and difficult tasks quickly. Integrated into this mobilization program are literally thousands of little businesses whose contributions are equally as essential."

MR. READ REVIEWED briefly the principal milestones in the discoveries and development of the uses of atomic energy during the past 60 years. He referred to the establishment of the Manhattan District of the U. S. Army in World War II, and continued: "Even during the period when the A-bomb was being designed, the scientists were searching for a way to produce one that might be many times—perhaps a hundred or a thousand times—more powerful. This was known as the H-bomb concept. Information has been given out that one obstacle was the problem of obtaining the extremely high temperatures required to unite or fuse and bring together, under certain conditions, two of the higher isotopes of hydrogen. A lead was found when the A-bomb generated temperatures as high as 50 million degrees Centigrade in one and one-tenth millionths of a second. Such temperatures in so brief a time period are difficult for the human mind to comprehend. As human beings, we are accustomed to a temperature span from a little below freezing—Centigrade zero—to boiling, which at sea level occurs at 100 degrees Centigrade.

"The nuclear physicists, however, were no longer earthbound. They had transferred their thinking to the heavens above, and were calculating how to duplicate the reactions of the stars, so as to create on earth—and make available to mankind under controlled conditions—the same sort of energy as that generated in vast amounts in these celestial bodies. This is literally what is now being contemplated in atomic fusion.

"The sun's temperature, for example, is calculated to be some 20 million degrees Centigrade. It is 93 million miles from the earth. It gives off energy by changing hydrogen to helium at the rate of 564 million tons per second, which is approximately seven million billion times the present rate at which electric power is generated in the United States. Seven million billion is seven followed by 15 zeros. Let us not overlook the sun as a source of future energy for our descendants here below.

"Some scientists by this time had calculated that in some stars the fusion of hydrogen isotopes generated temperatures some ten times that of the sun, and in a much shorter time. It was reasoned that if temperatures of a very high order could be obtained, as recorded in the A-bomb explosion, a fusion reaction could be produced.

"So it seemed possible now to trigger a fusion bomb with the atomic bomb. Men had explored the energy of the sun, and by-passed it to explore the source of energy of the stars—some of which, incidentally, in miles away from the earth are ten thousand times our two hundred and seventy-five billion dollar national debt.

"In summary, the A-bomb contains fissionable products of uranium which generate temperatures some 30 million degrees Centigrade higher than the sun. The hydrogen bomb contains fusionable products similar to the stars, and produces temperatures 200 to 400 million degrees Centigrade. . . ."

IN TELLING OF THE organization for the work at Savannah River Mr. Read stated that some 120 different skills and talents were combined in one technological effort to achieve the final design. Many phases of the project, he stated, were accomplished through subcontracting.

"A formidable assignment," continued Mr. Read, "was the selection of the site which had to meet rigid criteria established by the Atomic Energy Commission and the Department of Defense." He said the nature of the product established many unusual requirements for a site not involved in the case of an ordinary operation. In all, he said, some 114 different areas were investigated and in November 1950, three months after the contract was let, the Savannah River site was agreed upon.

Speaking of the operation problem of the new hazard of radiation, Mr. Read said in part: "We knew that all construction materials exposed to radiation would themselves become radioactive, emiting radiation of low intensity even after removed from direct exposure. The

severity of this emission falls off according to the half-life of its radioactivity but never ceases. The half-life is defined as the time required for the initial rate of radioactivity to be reduced 50 per cent, and can be determined by experiment." Concerning the human factors involved here, Mr. Read said this hazard forced the design of a plant "that would be semi-perpetual and automatic in its operation." He pointed out that such a design goes far beyond the normal economics of construction.

"You see," he said, "in a reactor the tremendous potential energy locked up in an atom must be released gradually. This requires controls so sensitive that human operation would be practically impossible. The pulse of the reaction must be taken continuously. The speed of electronic controls is imperative to do this, and also to automatically set in motion the nuclear corrective measures required to compensate for the slightest change.

"In the design of Savannah River, therefore, all known phases of today's technology were used, and I might add for the record, we came up with a few which did not previously exist.

"Each step in the process is designed to take raw material through one stage of conversion and deliver it in the desired quantities and quality to the next operation. Many of these steps consist of chemical treatment and separation, in which huge volumes of intermediate materials are purified and concentrated to deliver a small amount of finished product. The control must be precise in order that losses along the way do not make the process too expensive and impractical. . . .

"Mechanical precision and remote controls in certain parts of these processes is the key to their successful operation. Some of the equipment pieces weigh as much as 250,000 pounds, yet the tolerance requirements were as rigid as those of a watchmaker."

Pointing out that ordinary safety provisions such as warning signals, machine guards, and handrails are not sufficient for processes involved here, Mr. Read stated that at Savannah River safety had moved on from the human element to the electronics instrument which continuously monitors the conditions that might be unsafe. "But with the proper precautions," he added, "a plant of this type is as safe to operate as any other industrial plant."

Construction work, Mr. Read said, started in earnest in February 1951, less than three months after selection of the site. The peak force employed was 38,500 in September 1952, of which number upwards of 5,000 were technically trained employees.

In regard to the labor record he stated that the work has involved more than 172 million man-hours and not since May 1953 has there been any work stoppage to delay progress. The management, he declared, is proud of this labor record, and added: "It is certainly a measure of the attitude and spirit of cooperation of American labor when both parties deal from the top."

Mr. Read dealt at some length on the big part played by small business in this project. He said that at peak construction 160 persons were engaged in making purchases and that more than 87,000 orders representing almost $245,000,000 were placed with firms having fewer than 500 employees. "In fact," he said, "the record shows that 5474 of the 8100 vendors serving Savannah River were in this small business category.

SPARE PARTS PROCUREMENT

(Continued from page 31)

Personnel of the Procurement District are always alert to the possibility of making savings for the Government wherever possible. Maintenance of competition in the bidding for the Government contracts and the constant scouting for potential suppliers, especially in the regular commercial field, have produced annual savings of many thousands of dollars. In one instance 5,012 general coil assemblies were procured at a net saving to the Government of $188,600 on the basis of a 1949 unit price on 1,000 similar coils. This was accomplished by purchasing directly from the sub-contractor who made the coil for the wartime producer of the M2 mechanical smoke generator.

Complete spare parts procurement action reports are prepared monthly and forwarded to the spare parts section, Memphis General Depot, and to Chemical Corps Materiel Command. This provides timely information as to the status of each item being procured.

The San Francisco Chemical Procurement District has found it advantageous to hold meetings of division chiefs and other key personnel. It maintains a weekly record of the preceding week's work and activities and distributes a copy to each person attending the meeting. This record includes a review and discussion of the procurement status, progress, and problems involving every division of the district. It has been found that this frequent briefing of key personnel to keep them aware of the over-all procurement picture creates the team spirit and appreciation so necessary to make the district function smoothly and efficiently.

Thus, it can be seen that there is more to the production and inspection of spare parts procurement than just walking into a contractor's plant, placing a contract, inspecting the finished item, and paying for it. The procurement process is, in effect, a program that entails detailed preparation, constant production and inspection supervision, and follow-through by an organization having the know-how and *esprit de corps* to make the over-all operation a smooth-functioning process.

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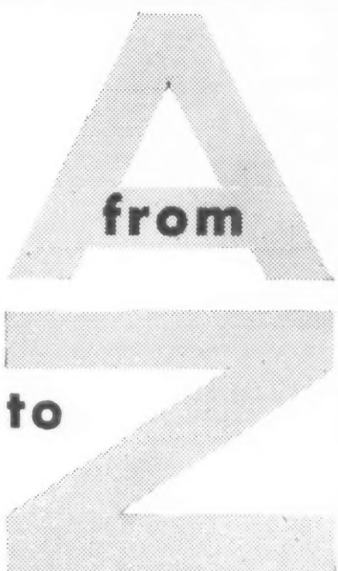

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CBR INSTRUCTION FOR HIGHER COMMAND

By Lt. Colonel E. Van Rensselaer Needels

Chemical Corps Representative

Command and General Staff College

"Service schools will include CBR training in appropriate programs of instruction for the various courses. CBR training will be designed to qualify the graduate for responsibilities commensurate with his grade and anticipated assignment." [1]

Much has been written about the amount and type of CBR training that company grade officers and lower ranks should receive. Primarily, soldiers must learn to take care of themselves, their buddies and their equipment. Company officers learn to use the tools of their trade. But what should higher commanders or general staff officers know about CBR warfare and where will they learn it?

Lt. Colonel E. Van Rensselaer Needels was assigned to the San Francisco Chemical Warfare Procurement District during World War II. He was transferred to Readjustment Division, Headquarters Army Service Forces in 1946. From 1947 to 1951 he was Chemical Corps Representative to the United Kingdom, a member of the committee on Standardization Among the Armies of the United States, United Kingdom and Canada, and technical advisor on chemical warfare to the Joint American Military Advisory Group, London. Colonel Needels graduated from the First Chemical Corps Advanced Course in 1947, and the Command and General Staff College in 1952. He is presently an instructor and Special Representative for Chemical Corps at the latter College.

At the Command and General Staff College selected officers are prepared for duty as commanders and as general staff officers at division, corps, army and comparable communications zone levels. What place is better for higher level instruction in the principles of CBR warfare than that College?

The College recognizes that CBR is no longer considered in the realm of nonconventional warfare. It is a member of the army weapons system and instruction in its use is integrated into all types of operations for all the levels of command within the purview of the College program of instruction. It is known that other nations, potential enemies, have CBR warfare capabilities. Therefore, our forces must be trained to defend against CBR attacks and to employ it offensively if required.

Orientation on CBR Policy

The first step in CBR instruction at the Command and General Staff College is an orientation on National Policy regarding CBR warfare, definition of chemical warfare, biological warfare, and radiological warfare, and the interrelationship of development and operational techniques among the three. The responsibilities of the commander and the general staff officers are outlined. Some principles of employment are presented as a basis for further study.

Subsequent instruction in CBR warfare is conducted as an integral part of exercises, map exercise, and map maneuvers. For example, in the fundamental unit on the Infantry Division in Attack, smoke is used to conceal a river crossing and to reduce enemy observation on a flank of an advancing force. Concurrently, persistent agents are used to economize on force in an area that is not desired for use by the attacker, while nonpersistent agents are employed to assist in the assault of an area which is to be occupied.

Considerable emphasis is given to the possible value of persistent agents in defense of extended positions. Lessons learned in the use of incendiaries in defensive operations in Korea were quickly brought into play in barrier planning at the College.

Improvements are continually being made in staff procedures for exploiting the technical information obtainable from the staff chemical officer. A recent case in point was the development of a standard form for a Chemical Fire Plan. In preparation of one instructional situation in which the chemical officer recommended that GB be used in the assault by an independent corps it was decided to issue a complete chemical fire plan, typical of what unit commanders, artillery officers and staff officers might have to contend with in the field. But what does a Chemical Fire Plan look like?

Chemical Fire Plan Developed

After considerable research, including examination of World War I field orders, it turned out that there was no standard form for the Chemical Fire Plan. So the problem was presented through technical channels to the Chemical Corps School of the need for development of a format and a plan which could be suitable for the particular exercise at hand. Very promptly, a team of instructors arrived at Fort Leavenworth who very ably assisted in preparation of a plan. This plan was fully coordinated among appropriate staff agencies within the College, adopted, and issued to the students. Thus, a deficiency was recognized and resolved, and doctrine was established which will have far reaching effect. In the future, CGSC trained officers will understand more about the workings of the Staff Chemical Officer, and that his ideas are finally integrated into the commander's plans, couched in standard army language.

A further outcome of this meeting of Chemical Corps School instructors and CGSC instructors was concurrence on the role of the Chemical Officer in the Fire Support Coordination Center (FSCC).

The doctrine, which establishes the Chemical officer as a member of the FSCC during the planning and execution of CBR and smoke operations as required, has

[1] SR 220-180-5.

subsequently, been approved by the Chief of Army Field Forces and is being incorporated in an appropriate field manual.

Prior to the 1954-55 academic year when smoke was played in problems, the standard procedure was to state in operations and plans, "See Smoke Annex," then in the list of annexes to state, "Smoke Plan (Omitted)." When it was decided to actually issue a smoke plan a standard format for such a plan could not be found. None of the Chemical Corps officers on the Staff and Faculty or among the students could recall having seen one for larger commands, although, obviously, some type of plan had been issued to produce vast smoke screens during World War II, and numerous operations in Korea.

A Standard Format for Smoke Plan

A smoke plan was drawn up at the College which seemed to provide the information and implementing instructions for a large smoke operation, in a form consistent with good operations order and overlay technique. The draft was forwarded to the Chemical Corps School for comment. Subsequently it has been refined and adopted as a suitable standard smoke plan for use at both schools. Again the collaboration between the Chemical Corps School and the Command and General Staff College improved the instruction in CBR at both institutions, and standardized procedures of interest to officers at all command and staff levels.

The Chemical Corps is normally represented on the Staff and Faculty of the Command and General Staff College by two officers. One officer is designated Special Representative for Chemical Corps, as are representatives for all the technical and adminstrative services. Currently, one officer is assigned to the instructional department responsible for presentation of the Special Weapons Course as an instructor and advisor on Chemical Corps matters in that field.

Manuals Reflect CBR Doctrine

In the training literature field, the College has produced during the past two years complete revisions of the major staff officer field manuals and field service regulations which are its responsibility. These manuals, among them FM 100-5, Operations; FM 100-10, Administration; and FM 101-5, Staff Organization and Procedures, will soon be ready for issue. They present a substantially increased coverage of CBR warfare doctrine and more thoroughly delineate the position of the Staff Chemical Officer.

The Command and General Staff College is aware of its responsibility for educating potential high level commanders and staff officers in chemical, biological and radiological warfare matters. CBR doctrine is kept current by means of liaison with all the Chemical Corps Commands and the Office of the Chief Chemical Officer.

Through the medium of training literature it provides the opportunity for army-wide acquaintance with modern CBR operational doctrine.

Thus, the academic approach is made in instilling broad doctrine in CBR to higher commanders. The effectiveness of this instruction must be tested in the field.

INDUSTRIAL MOBILIZATION

Approximately 140 key military and civilian representatives from the staffs of the Office of Assistant Secretary of Defense (Supply and Logistics) and the Departments of the Army, Navy and Air Force participated in a Forum on Industrial Mobilization Planning, held at the Henry Hudson Hotel in New York on October 13, 1954.

The Defense Department's Production Allocation Planning Program, evolved last January, is designed to restrict development of mobilization planning to those items which are essential in wartime.

Mr. Paul A. Longo, Chief of the Planning Division of the U. S. Army Chemical Corps in New York, Chairman of the Group, outlined the operational principles upon which the Program will be developed.

Other speakers included Dr. Gustav Seidler, representative of the Deputy Chief of Staff of the Army for Logistics, and Mr. J. Lewis Powell of the Office of the Assistant Secretary of Defense (Supply and Logistics).

TAKES VEHICLE SAFETY COURSE

Mr. William H. English, the Army Chemical Center's Safety Director, has returned from The Traffic Institute of Northwestern University, Evanston, Ill., where he completed a four-week course in military vehicle safety. He was one in a group of 32 selected by the Army to attend this course.

PHYSICALLY HANDICAPPED

As a result of a continuous program aimed at employment of the physically handicapped for their special abilities, 73 persons with varied degrees of handicap are presently employed at the Army Chemical center. Thirty-two of these employees have lost a leg or a foot or because of paralysis are on crutches; twenty-seven have lost arms, hands, or fingers, or are otherwise seriously handicapped, while fourteen have impaired vision.

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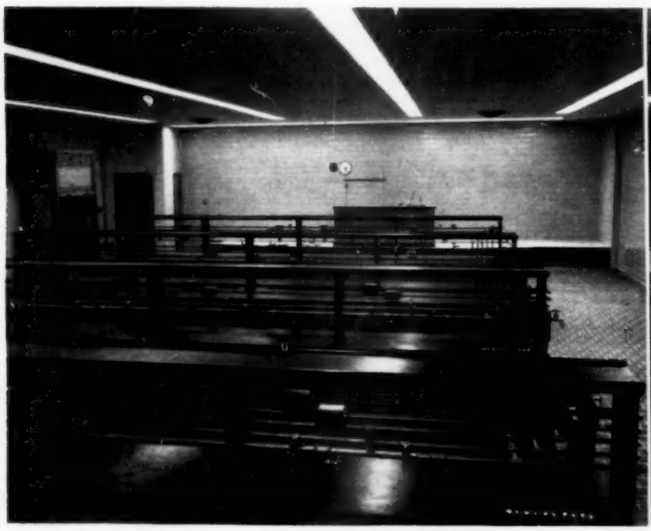

1. The air-conditioned Chemical Corps School building at Ft. McClellan, Ala., contains fourteen 50-student capacity classrooms as well as offices, laboratories, an auditorium, and a library.
2. The School library, with space for 50,000 books, is provided with an electric book lift, facilitating quick reference.
3. This fully modern chemistry laboratory has capacity for 40 students.
4. The long-needed school auditorium seats 492 persons.
5. One of two new 500-man barracks for Chemical Corps enlisted men.
6. Each of the new barracks for enlisted men at Chemical Training Center has two dayrooms. Steam heat and mechanical air conditioning are standard throughout the living quarters.

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6

WAR-TIME FUNCTIONS OF PULP, PAPER AND PAPERBOARD

By Downing P. Brown

This article by the late vice-president (Administration) of the Brown Company, Berlin, N. H., reviews the essentiality of paper in a war economy and gives some interesting sidelights on expedients to meet critical shortages which, the author states, have characterized every major war in which we have engaged. The article was prepared especially for the Journal by Mr. Brown not long before his death last April.—Editor

DOWNING P. BROWN

Mr. Downing P. Brown, son of the founder of the Brown Company of Berlin, N. H., pulp and paper manufacturers, and a member of A.F.C.A., died on April 1, 1954. He had been associated with the Brown Company for forty-six years and had worked at the various establishments of that concern, including its plant in Canada. Known as an authority in all phases of the pulp and paper industry, Mr. Brown was a member of several nation-wide committees. He was made vice-president of the company in 1944 and at the time of his death was located at the company's offices in Boston. Born in Portland, Maine in 1887, Mr. Brown joined the Brown Company in 1908 following his graduation from Williams College. One of his first assignments was assistant to the manager of the woods department. In World War I he served in the Army Forestry Battalion. In World War II he was a company contact man with the government on matters pertaining to production and sales.

Introduction

The pulp, paper and paperboard industry of the United States is primarily a service industry. In war or in peace there is no segment of the economy, industrial or agricultural, that this industry does not serve. Because of the breadth of the market for paper and paperboard, the character of the industry's production at all times must be geared to the requirements of the over-all economy. Thus, one pattern of use may be necessary in time of peace and an entirely different pattern of use in time of war. At all times, the industry assumes the color of essentiality of the over-all economy that it serves. To the extent that there is austerity in the over-all economy, that austerity must inevitably be reflected in the character of demand for paper and paperboard.

This concept of the pulp, paper and paperboard industry as a service industry has too frequently been ignored in the planning and execution of this country's major wars. In every major war that this country has fought, shortages of pulp, paper and paperboard have developed to plague the planners. In most cases, official embarrassment could have been avoided had there been more timely consideration of the service function of the pulp and paper industry and of the importance of its products in a war economy.

In the Revolutionary War, for example, shortages of pulp, paper and paperboard were so stringent that it became necessary to exempt all skilled papermakers from military service. History records that the published sermons of the Reverend Gilford Tenant were commandeered by the Continental Army to wrap the black powder and lead balls used as ammunition in their muskets at the battle of Monmouth. Similarly, in 1777, two wagon loads of Fox's "Book of Martyrs" were requisitioned to provide the paper needed for ammunition used to fight the battle of Brandywine. In the War of 1812, because total pulp, paper and board requirements were not properly planned, it was again necessary to exempt all skilled papermakers from military conscription. So stringent did the shortages of paper and board become during the Civil War that Northern papermakers were obliged to import the linen wrappings stripped from Egyptian mummies to provide the fiber needed for essential war-time paper production.

The most valuable lessons about the behavior of pulp and paper in a war economy can be learned from an examination of the industry's more recent experiences in World Wars I and II. Surprisingly the pattern of behavior of this industry in both of these global wars was almost identical.

Prior to World War II, this country was dependent upon Europe for almost one-fourth of its total supply of wood pulp. Dependence upon overseas' supply sources was even heavier prior to World War I. With the outbreak of each World War, it immediately became apparent to pulp consumers that the flow of pulp from Europe

to this market could be easily stopped by enemy blockade. Prior to our entry into each World War, therefore, consumers strove desperately to maximize their inventories as a hedge against the possibility of economic blockade.

Thus, the United States entered both World Wars with its larders of pulp and pulp products fully stocked. For a year following the sinking of the Lusitania, and for a year following Pearl Harbor, the accumulated stocks of pulp and pulp products were of such magnitude as to depress end-product sales, prices and profits, at a time when the over-all economy was enjoying a war-time boom. Because of this condition of oversupply, the attitude of both the authorities and the public toward the pulp and paper industry, during the first year of each war, was one almost of scorn. There was even talk of shutting down productive facilities in the primary pulp and paper industry and of concentrating production to conserve essential labor and materials. Fortunately, however, conditions changed before such proposals could be implemented.

As the defense programs of World Wars I and II moved into full swing, however, domestic demands for pulp and pulp products for essential war-time uses rose sharply. At the same time, fiber supply declined sharply, as excessive inventories in the channels of distribution were liquidated and as the effects of the stoppage of overseas' imports began to be felt. When our war-time allies, who had historically relied heavily upon blockaded Scandinavia for a major portion of their pulp requirements, turned to North America for replacements, the imbalance of supply and demand became desperate, and stringent controls of the North American pulp and paper economy were instituted by the Government to insure the success of the war effort.

The experience of two World Wars have taught this country, in no uncertain terms, that continued dependence upon overseas' supply sources for basic fiber needs can never be consistent with the objectives of national security. This lesson was underlined and reemphasized during the Korean War when controls were reinstituted to remedy the situation created when foreign suppliers diverted an important quantity of fiber from the American market to more profitable foreign markets.

Since the end of World War II, however, capacity for the production of wood pulp in North America has been increasing rapidly. Total wood pulp capacity in the United States by early 1955 will exceed 1946 capacity by 75%, and 1937 capacity by 163%. Canada's capacity by early 1955 will exceed her peak postwar production by 12½%, and her peak prewar production by 91%. Dependence upon Europe for basic fiber supply is accordingly shrinking rapidly. As a consequence, the North American pulp and paper industry, in the event of another world conflict, should have far less difficulty than has been experienced in the past in fulfilling its obligations to the military services and to the defense economy.

Those charged with the responsibility for planning our national security should be fully aware of the nature of this industry's war-time obligations, however, and avoid mistakes of judgment that might ultimately impair the industry's ability to meet those obligations. The functions of pulp and pulp products in a war economy can perhaps best be understood by examining the markets for these products.

"Cultural" Papers, "Bullets of the Brain"

The earliest use of paper was for writing, and writing remained the most important single use until sometime after the introduction of printing in the Fifteenth Century A.D.

In the United States, the production of cultural papers for writing and printing exceeded production for all other uses combined until about 1914. Currently, writing and printing papers constitute about 22½% of this country's total paper and board production.

Shakespeare aptly characterized papers used for cultural purposes when he referred to them as "bullets of the brain." Everyone looks forward hopefully to the day when the power of the pen may in fact be mightier than that of the sword. Cultural papers, as the media for education, information, and communication constitute one of the major instruments of peace. Yet in time of war, these same papers constitute one of our major implements of war.

In most instances, there is little change in the physical character of these products in the transition of the economy from peace to war. There are exceptions, of course—wet strength map papers and fluorescent map papers, developed during the past war, are typical exceptions familiar both to the Air Corps and the ground forces. Generally speaking, however, the change is a change in the nature of the use of the product, rather than in its physical appearance. Our publications, in time of war, become the media for training our armed forces, our citizens, and our skilled workers, the media for stirring a martial spirit among the public, the media for acquainting the public with the progress of the war and enlisting its support for Civilian Defense programs, bond drives, conservation drives, scrap programs, blood bank and rehabilitation programs, and countless other war-related activities. Both the editorial policy and advertising policy of publications are directed wholeheartedly toward these ends.

Our communication and record papers, in time of war, become a tool for planning and executing projects directly related to military and defense production. From the blueprint paper used to plan the production of a bomb to the map that marks its target, each step of the way, these papers have an important role to play. The essentiality of these "bullets of the brain" must always be judged in the light of the relative essentiality of the use and of the user.

Occasionally, specific wartime uses of paper that appear on the surface to be profligate are viewed by the public with askance. The size and content of our daily newspapers during time of war is the one war-time use of paper that is most commonly questioned. Quite apart from the debatable issue of how much paper newspapers require to perform their very essential war-time function, the fact remains that the paper used for the production of newspapers serves a two-fold function—it is not only a production material for the newspaper publisher, but, after its initial use, a salvageable raw material for the container manufacturer. Old newspapers provide the basic fiber for a very substantial proportion of our total production of containerboard. Over 80% of the newsprint consumed in this country is imported from Canada; it is not feasible for Canada to ship an equivalent tonnage in the form of virgin pulp. Irrespective of whether the newspaper publisher is unduly profligate in his war-time use of newsprint, therefore, he is performing a useful war-time function by serving as a conduit for essential fiber supply, that, without him, could never be delivered to other channels of use that directly serve the war production program.

Packaging

While the limited use of paper and paperboard for packaging is almost as old as paper itself, the growth and development of the packaging industry of this country

since the 1920's has been one of the major phenomena of this generation. The development of the chain store, the supermarket, the suburban shopping center, the frozen food industry, concentrates and dried foods, has revolutionized our system of distribution just as completely as the Industrial Revolution revolutionized our manufacturing processes in earlier generations.

Currently, approximately 56½% of the total volume of paper and paperboard produced in the United States is used for packaging purposes—to contain or wrap the products of American agriculture or industry. More paper and paperboard is used in the manufacture of containers, for example, than tin, steel, glass, plastics and all other packaging materials combined.

The character of our over-all national production changes drastically in time of war, and the packaging industry must adapt itself quickly to these changes. Most of our war materials must be packaged, and packaging materials assume exactly the same degree of essentiality in time of war as the materials packaged. Further, the conversion of this country's productive facilities from civilian to defense production often means a complete change in the physical character of packaging requirements. Planning for the distribution and delivery of war materials is fully as important as planning its production.

One of the major functions of our defense planners in time of war is to modify and improve upon the system of distribution that they inherit, and to adapt it to the needs of military supply and ordnance. Admiral W. B. Young, Chief of the Bureau of Supplies and Accounts for the Navy during World War II, stated the problem succinctly when he said, "If it's worth making and shipping, it's worth packing right." In the same vein, General A. A. Vandergrift, Commandant of the Marine Corps, observed: "The success of an entire campaign may depend upon supplies being given the protection necessary for safe delivery."

To develop new types of containers that would *protect* the vast volume of war materials that had to be moved from the factories to the fighting fronts was a major problem of the domestic paper and paperboard industry. The nature of the problem was ably outlined by a high ranking Navy officer who had seen service in several combat areas during the last World War: "No one knows when supplies are packed, which or how many of the Seven Seas they will have to traverse or in what quarter of the globe they will be used, or when. They must be ready for instant use whether they are unboxed on an Arctic Island in the dead of winter, in high summer on a glaring desert or in an equatorial swamp. Boxes may be dredged by steam winches from deep in the ship's hold to be tumbled into wave-tossed lighters miles from shore, then landed in warehouseless beachheads and piled exposed to the elements for days or weeks, or floated through breakers to a harborless shore after weeks spent lashed on storm-drenched decks. They may be shaken like dice in loading nets, or hoisted with plate hooks.

"Transportation may include overloaded cargo ship, combat vessel, airplane, submarine, jeep, dog-sled, raft, stone boat, mule, camel or burro back; native porters or war-bruised soldiers may tote them part of their journey over mountain trails or through steaming jungles; some are dropped by parachute through belligerent fire or tossed from speeding trucks in combat zones. War transit does not know the cautions: 'Fragile,' 'Handle With care,' and 'Use no hooks.' "

To solve this basic problem of distribution and supply, the paper and paperboard industry pooled all of its technical knowledge, and developed solid fiber containers that were completely weatherproof and completely waterproof. These containers, known as V-boxes, could withstand maximum punishment — frequently during landing operations, they were thrown into the surf and floated ashore, and often they were stored in the open for long periods, subject to all kinds of weather conditions. Containers of this type were produced in prodigious volume during World War II, not only because they afforded maximum protection, but because they were light and easy to handle, and because they required a minimum amount of shipping space.

V-boxes constituted a major use of paper and paperboard for war-time packaging. There were hundreds of other uses that because of space limitations cannot be catalogued. Wrapping paper, paper shipping sacks, paper bags, cellulose wadding, fiber cans, to name a few, performed many new and specialized war-time functions. In many of these war-time uses, paper served as an efficient substitute for other materials that were unavailable or in critically short supply.

Building and Construction

One of the fastest growing uses of paper and paperboard has been for building and construction. Since 1928 the use of paper and paperboard for construction purposes has more than quadrupled. About 12½% of the country's total paper and paperboard production is currently designed for use by the building industries. Walls, ceilings, floors, insulation, roofs, and sidings are some of the items that are being made in increasing volume from fiber-based products.

In time of war, Government regulations insure that only the most essential type of building project will be authorized. The use of critical materials for building is so rigidly controlled that any materials used for building purposes are a fortiori in our first line of defense.

Because of the ease with which they are handled, the speed with which they are assembled, and the savings in labor and critical materials that their use entails, building papers and paperboards lend themselves much better than most materials to use in war-time construction. In defense plan construction, in defense housing, in the construction of temporary buildings to house the war agencies in Washington and elsewhere, in the construction of barracks and other military installations, these products of the pulp and paper industry played a major and memorable war-time role.

Health and Sanitation

Another fast growing segment of the pulp and paper industry has been that which produces products used to promote public health and sanitation—toilet tissue, paper towels, paper handkerchiefs, sanitary napkins, surgical dressings, sputum cups, table napkins, cups, plates, eating utensils, etc.

United States consumption of all types of sanitary papers has more than trebled since 1935. Production of paper for sanitary and hygienic purposes currently constitutes about 5½% of our total paper and paperboard production.

Use of these products has been found to be a boon to the control of war-time epidemic and disease. Products in this category are familiar items in military hospitals, in military mess halls and kitchens, in defense plants where they are used for hygienic purposes and for in-plant feeding. So great was the war-time demand for these products to service direct military and industrial needs, that serious shortages frequently occurred during the last war in the supply available for essential civilian consumption.

Other uses of Paper and Paperboard

The use of paper and paperboard for writing, printing, packaging, sanitation and construction, as we have seen, absorbs 97% of our total domestic paper and paperboard production. The remaining 3% is consumed in a wide range of specialty uses, some highly essential, some frivolous.

In a defense economy, the frivolous uses become early war-time casualties, as fiber flows into the production of specialty papers with priority status. Condenser tissue, electrical insulation papers, industrial filter papers, matrix paper, vulcanized fiber sheets, cigarette papers are a few of the more essential paper products included in this category.

Military Explosives

Dissolving wood pulp supplied about half of the nitrating pulp used to produce the military explosives used by our armed forces during World War II. Cotton linters pulp supplied the other half. The relative consumption of wood pulp increased steadily as the war progressed, while the relative consumption of cotton linters declined.

Other types of wood pulp were used by our Allies, as well as by our enemies, to produce military explosives by the "cordite" process. Our Allies relied largely upon Canada and the United States for the basic supplies of wood pulp needed to produce their munitions.

Demand for dissolving wood pulp for the production of military explosives of all types created a heavy drain upon this country's available supply of dissolving pulp. Since the end of World War II, however, new productive faciilties have been installed, or will shortly be installed, that will result in a doubling of this country's dissolving pulp capacity. Further, it is expected that research currently being undertaken will serve to broaden the range of dissolving wood pulps that can successfully be used for this purpose.

Rayon and other Fiber-based Products

From the standpoint of National Defense, this increase in dissolving wood pulp capacity is important, for this product has other important war-time applications.

Dissolving wood pulp, for example, is the basic raw material for *rayon* manufacture. War-time shortages of natural fibers resulted in sharp increases in the demand for rayon fabrics for hundreds of esential war-time uses. The introduction of rayon tire cord for planes, trucks, and heavy mobile equipment was but one of a number of innovations that increased dissolving pulp requirements in the rayon industry. Since the war, rayon has taken over practically the entire tire cord market.

Dissolving pulps are also an important raw material in the production of photographic file, cellophane, paints and plastics. A list of the military applications of any one of these products would be impressive. Space permits but one example. Referring to the use of paper plastics, a War Production Board release stated "The British Mosquito plane, one of the world's lightest, fastest and most useful planes, is built of layers of paper and plywood. The Lancaster bomber contains over 1,500 paper components. Gliders have been made of paper ....."

Conclusions

The range of war-time uses for pulp and pulp products is virtually unlimited. A War Production Board expert, with the aid of a slide rule, estimated that one cord of pulpwood, converted into the basic part of smokeless powder, is used to fire 90,000 bullets in a Garand rifle or 420 shells from a 105 mm gun, or 24 shells from 16 inch guns. It will also produce 4,200 weatherproof packages to carry life saving blood plasma, 3,336 containers for first aid kits with emergency battle dressing and sulfa tablets, 16,444 hospital waddings for field treatments and emergency operations, 1,500 fiber parachutes for bombing flares or for food supplies, 1,440 anti-tank mine covers, 2,148 watertight jackets for 37 mm shells, 800 warm vests for aviators in high altitudes, 1,560 containers for K rations, 900 tough multiwall commando bags for bulk foods and supplies, 1,200 yards of ordnance wraps to protect airplane engines from rust, 6,120 military maps, 72 protective rings for 1,000 pound bombs, and 1,800 grommets for 5 inch shells.

From the wood that is harvested for use by the wood pulp industry, through conversion and reconversion, springs one-tenth of the total wealth generated annually by the entire American industrial economy. Economic and social values pyramid as this basic raw material moves successively through various stages of conversion and use.

Unlike many of our critical raw materials, wood is abundantly available on the North American continent—none is imported from overseas. Since World War II, there has been a well-balanced expansion of facilities for the conversion and reconversion of this wood into end-products essential to the operation of our American economy. In the event of a new World War, North America, as a result of postwar expansion, can be completely self-sufficient in respect to wood pulp and all of its products. The fact that we shall no longer be dependent upon overseas' supply sources for basic fiber requirements should mean that the adminstrative task of war agencies should be materially simplified. It will not mean, however, that there will be no problems in adminstering the war-time affairs of this industry. All could be lost, for example, if the basic flow of wood from the forest to the pulp mill is not maintained, or if policies governing the use of skilled labor and minimum requirements of chemicals, maintenance materials and operating supplies in the plant are unduly oppressive. It is scarcely conceivable, however, that the "for want of a nail" psychology would be employed by the authorities to interfere with the generation of military and economic values as vast as those created by the fiber-dependent industries.

The conversion from peacetime to war-time production is easier for this industry than for most industries; in the event of another war, as in past wars, we shall be ready to perform our war-time function before most industries have even begun their physical plant conversion. Eventually, however, as over-all defense production mounts, war-time demand, as always, will strain even the expanded productive facilities of this industry. The change in the volume and character of our national production necessitates drastic changes in this industry's pattern of distribution. It is in the conversion from peacetime to wartime *distribution* that this industry, in any future war, will encounter its major administrative problems. Intensive consultation with the war agencies should insure, however, that pulp and its products will flow in channels that will insure maximum benefit to any military program that this country undertakes.